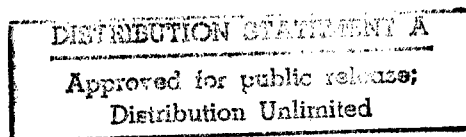


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30 JANUARY 1987



# USSR Report

SCIENCE AND TECHNOLOGY POLICY

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30 JANUARY 1987

USSR REPORT  
SCIENCE AND TECHNOLOGY POLICY

CONTENTS

ORGANIZATION, PLANNING AND COORDINATION

Aganbegyan on USSR Economic System Updating (A. Lepikhov; NTR: PROBLEMY I RESHENIY, No 14, 22 Jul-4 Aug 86).....	1
Steps for Radical Improvement of Product Quality (STANDARDTY I KACHESTVO, No 8, Aug 86).....	12
Role of Standardization in Accelerating S&T Progress (V.P. Blinov; STANDARDTY I KACHESTVO, No 8, Aug 86).....	24

FACILITIES AND MANPOWER

Problems of Establishing Interbranch Scientific Technical Complexes (A. Tarasov; PRAVDA, 4 Nov 86).....	36
---	----

TRAINING AND EDUCATION

Training in Patent Affairs Stressed  (M. Temchina, G.D. Malushkov; NTR: PROBLEMY I RESHENIYA, No 16, 19 Aug-1 Sep 86).....	40
---	----

## AUTOMATION AND INFORMATION POLICY

State Research and Development Registry Described (Yu.Ye. Berezin; NTR: PROBLEMY I RESHENIYA, No 17, 2-15 Sep 86).....	44
--	----

## PATENTS AND INVENTIONS

Lubricant-Testing Innovation Queried (M. Treyger; NTR: PROBLEMY I RESHENIY, No 14, 22 Jul-4 Aug 86).....	47
--	----

## INDUSTRIAL AND COMMERCIAL APPLICATION

Critique on Delays in Implementation of Innovative Developments (P. Osminin; IZVESTIYA, 16 Oct 86).....	49
Briefs	
Pyrite Treatment Technology	53
Automation Shortens Production Cycle	53
Petrometals Extraction	53

## INTERNATIONAL S&T RELATIONS

U.S. Scientific Centers Described (N. Dvoretz; NTR: PROBLEMY I RESHENIYA, No 19, 7-20 Oct 86).....	54
--	----

## REGIONAL ISSUES

Developments in Yakut ASSR Described (NTR: PROBLEMY I RESHENIYA, No 19, 7-20 Oct 86).....	58
Scientific and Technical Progress in Moscow Described (A.S. Kolesnikov; NTR: PROBLEMY I RESHENIYA, No 19, 7-20 Oct 86).....	60
Inadequate Use of Scientific Potential of Uzbek SSSR Discussed (PRAVDA VOSTOKA, 12 Nov 86).....	63

## CONFERENCES AND EXPOSITIONS

Special Inventions Commission Established (An. Shakhov; NTR: PROBLEMY I RESHENIYA, No 19, 7-20 Oct 86).....	68
---	----

## AWARDS AND PRIZES

### Lenin and USSR State Prizes Awarded for Scientific Achievements

(A. Aleksandrov; PRAVDA, 8 Nov 86)..... 70

## GENERAL

### Contributions of Mechanics to Progress

(I. Obraztsov; PRAVDA, 28 Sep 86)..... 73

### Merit System of Remuneration for Scientific Personnel

#### Discussed

(A.A. Tursunov; PRAVDA, 3 Aug 86)..... 76

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## ORGANIZATION, PLANNING AND COORDINATION

### AGANBEGYAN ON USSR ECONOMIC SYSTEM UPDATING

Moscow NTR: PROBLEMY I RESHENIY in Russian No 14, 22 Jul - 4 Aug 86 pp 4-5

[Interview with Academician A. Aganbegyan by A. Lepikhov: "An Economic System of Acceleration"; date and place not given; first paragraph is NTR commentary; first indented paragraph is quote by Aganbegyan; other indented material appears in boxes throughout original text]

[Text] To make the economic system dynamic, balanced and maximally receptive to scientific and technical progress and to ensure the vital interest and responsibility of all units of the national economy toward introducing the newest achievements of science and technology and toward emerging at advanced milestones in the world--these are the basic tasks set for us by the resolutions of the 27th CPSU Congress. The main lever for introducing the achievements of science and technology into production under socialist conditions is the plan. Therefore, the primary task lies in reorganizing planning so that it corresponds to the greatest extent to the implementation of scientific and technical progress and ensures the fusion of assignments to incorporate science and technology into other parts of the plan--on production, capital investments, labor productivity, production cost reduction, etc. There is one way--the plans for production, capital investments and rise in economic indicators must be based on the newest achievements of science and technology.

"A characteristic feature of the 12th Five-Year Plan lies in the fact that in it, for the first time, the basic tasks of the country's social and economic development are intrinsically tied and fused together and that their solution is linked with the consistent reorganization of the entire system of national economic administration."

Since 1964 our country's national income has increased by a factor of four, and industrial production--by a factor of five. Except for Japan, not one of the developed capitalist countries has achieved such indicators.

Nevertheless, the degree to which the potentials of the economic system of socialism are utilized already fails to give rise to satisfaction in Soviet society.

Just how did such a situation form? How can this imminent crisis be dealt with?

This is the subject of our conversation.

[Question] The 27th CPSU Congress adopted a program of accelerating the country's economic and social development. Why has this problem of acceleration arisen precisely now, and with such acuteness?

[Answer] Because in the last 10-15 years the economic situation in the USSR has changed radically. Certain difficulties, including objective ones, have begun to be perceived in economic development.

In the first place, external: I have in mind the arms race thrust upon us. In the second place, internal: expenditures for the extraction and transport of oil, gas, ore--practically all raw material--have risen substantially.

Think about just one figure. About 5 billion tons of conventional fuel are extracted in the country yearly. This makes it possible not only to satisfy our own internal needs, but also to make large supplies to the countries of the socialist commonwealth that do not have large raw material and fuel bases. With such a scale of extraction, however, the easily accessible natural resource deposits are, unfortunately, being rapidly depleted. And so--our main fuel-energy bases are being shifted to the east and to the sparsely populated northern regions.

In the 12th Five-Year Plan capital investments in the development of the fuel-energy complex are being increased by 35%;

The yearly growth rates established for the five-year plan for the gas industry, which is given priority, are 6-7%;

Western Siberia is slated to obtain 90% of the increase in gas extraction in the current five-year period;

It is specified that seven powerful main gas pipelines, each several thousand kilometers long, be built for this purpose;

Coal extraction in the country will reach 69 million tons, using the most efficient method--open pit;

Extraction of oil, including gas condensate, in the country will increase by 40 million tons by 1990. It will reach 635 million tons, having exceeded the total 1985 indicator by 40 million tons;

Petroleum extraction is to increase by a factor of 3, through raising the yield of the oil-bearing beds;

The relative importance of generating electrical power at AES is outlined for a rise by a factor of approximately 2; its share in the country's energy balance will reach 20%.

The demographic situation is also unfavorable for us--the war has left its reminder, a "second echo": the children of those who were born in the years when the birthrate fell sharply are coming of working age. Indeed, people who were not at the front have begun to arrive at pension age, and there are two-three-fold more of them than there are of war veteran pensioners. As a result, in each five-year period we are now short approximately 8 million working hands. This means that we must no longer, as we did before, count on maintaining high growth rates through drawing in additional natural and labor resources.

And yet, this only partially explains the considerable reduction in the rates of social and economic development that has taken place in the last three five-year plans. I recall, that the utilized national income increased in the Eighth Five-Year Plan (1966-1970) by 41 percent, in the Ninth Five-Year Plan--by 28 percent, in the 10th Five-Year Plan--by 21 percent, and in the last, 11th Five-Year Plan (1981-1985)--by 16.5 percent.

The main causes of these negative tendencies lie in the subjective sphere. They are connected with shortcomings and mistakes in administration.

In the past decade, as was noted at the 27th CPSU Congress, the fundamental changes in the economic situation were not taken into consideration to the proper extent, the necessary persistence in reorganizing the structure of national production, the administrative system and the methods and actual psychology of the economy was not shown. The economic system continued to be developed on a primarily extensive basis. I will give a few examples to point out what this led to in practice.

Let us say, the sphere of producer goods repair swelled inordinately. Over 35 billion rubles a year are spent for this purpose. A paradoxical situation was formed in ferrous metallurgy: the yearly cost of repair exceeded the amount of capital investments. Since the existing enterprises were not technically reequipped for a long time, the number of workers engaged in manual labor did not decrease. New work places also are not always completely mechanized.

There is one more special feature of our past economic development. A process of reducing the growth of investments in the national economy was in progress--from 32 percent in the 10th Five-Year Plan (1976-1980) to 16 percent in the 11th (1981-1985). At the same time, due to the deterioration in the mining-geological conditions for extracting fuel and raw material and the prolonging of the periods for developing a new fuel-energy base in the eastern and northern regions of the country, the development of the extraction industry was delayed. In the last five-year plan the volume of fuel and raw material extraction increased by approximately 8 percent (as compared with 10 percent in the 10th and 25 percent in the Ninth Five-Year Plan).

All of this has required vigorous, decisive measures to bring about a turning point in the negative tendencies and give new impetus to our economic system and social processes. This is precisely why the party, at the 27th CPSU Congress, set the task of accelerating the social and economic development of the country. The production potential in our country is to double in the next 15 years, after being revitalized in fundamental high-quality fashion.



[Question] The frank, serious discussion of the tendencies, including the unfavorable ones, which took place at the Congress, provoked some Western specialists to form the opinion that the economic program proposed by the USSR is unrealistic...

[Answer] The reality of this program is based on the tremendous potentials for mobilizing our society's organizational and social reserves and the increasingly complete utilization of all available resources.

The effect from these measures can as a rule be obtained in a brief period, and does not usually require major capital investments. This work, connected with activization of the "human factor" primarily, is already successfully underway.

When speaking at a meeting with the workers of Kuybyshev Oblast in April 1986, Mikhail Sergeyevich Gorbachev, general secretary of the CPSU Central Committee, gave several detailed examples.

The workers of the Kursk Leather Production Association, through their own efforts, manufactured equipment which made it possible to organize complete processing of the wastes and make full use of all the raw material. At the Vatra Association of the Ministry of the Electrical Equipment Industry, large capacities to produce illumination engineering items were developed in two months--nine-fold faster than the normative periods.

The kolkhozes and sovkhoses in Estonia, through efficient use of agricultural equipment and maintaining the proper procedure when storing and utilizing petroleum products, succeeded in reducing the relative norms for gasoline consumption by 22 percent, and for diesel fuel--by 29 percent. If the experience of the Estonian workers is disseminated on a countrywide scale, it will make it possible to save about 9 million tons of liquid fuel yearly.

One more example. The engineers and designers of Uralmash took on additional, above-plan commitments to develop, in a short time, new, high-efficiency equipment to modernize the Magnitogorsk Metallurgical Combine. As early as this year they will complete the working plan draft of new, continuous-action steel-pouring machines. Putting them into operation will make it possible to obtain from each one a million tons of molten metal, and 200,000 tons of rolled metal more than has been obtained up to now.

[Question] The July session of the USSR Supreme Soviet ratified the State Plan for Economic and Social Development 1986-1990. What distinguishes it from the previous ones?

[Answer] First of all, the fact that the plan designated the precise boundaries of the basic social-economic directions drawn up by the 27th CPSU Congress. Its characteristic feature lies in the fact that in it, for the first time, the basic tasks of the country's social and economic development are intrinsically tied and fused together and that their solution is linked with the consistent reorganization of the entire system of national economic administration. In this way, the economic mechanism will become an efficient lever for economic growth.

The concept of acceleration, forming the basis of the assignments of the new five-year plan, is manifested not only in the rates, but also in the substantial increase in the absolute increments in the most important economic indicators.

For example, national income, which characterizes the end results and effectiveness of economic activity, is to increase, in the 12th Five-Year Plan, by 124 billion rubles--as opposed to 79 billion rubles in the last one (in 1983 prices), its growth rates are to reach 4.1 percent, and in the future--in the 13th and 14th five-year plans--its growth rates are to increase to 5 percent and above. This will make it possible, in the 15th period, to almost double the volume of the country's national income. Since the increase in resources will subsequently, for objective reasons, be reduced, these milestones--real, scientifically substantiated milestones--can be reached only through a sharp increase in the efficiency of the economic system.

The country has taken a course toward comprehensive intensification of the national economic complex, toward further development and efficient use of the scientific-technical potential and toward bringing the forms of the socialist economy into accordance with today's conditions and public demands. Only this approach will make it possible, as was emphasized in the Political Report of M.S. Gorbachev to the 27th CPSU Congress, to increase, by the end of the century, labor productivity by a factor of 2.3-2.5 and simultaneously reduce the energy-intensiveness of national income by a factor of 1.4 and metal-intensiveness--by a factor of almost 2. The intention is to bring about a fundamental turning point in the tendency to reduce the capital-output ratio, and to achieve its stabilization from the start and then--its increase.

[Question] What possibilities for this does domestic science have at its disposal?

[Answer] Soviet science has a strong position and pioneering developments, and an ever-increasing number of our technological processes are based on the principal achievements in fundamental sciences.

There are numerous examples of them: laser and radiation treatment of materials, gene and cell engineering, powder metallurgy, and others.

Whole technological systems are gradually being formed on the basis of this type of development. They alter production as a whole, not its individual parts. These are, for example, converter production of steel, with its continuous pouring and regulated rolling, rotary and rotary-conveyer lines, information technology based on computers, flexible production systems in machine building and various biotechnological processes.

Capital investments solely for updating the machine building complex are being allotted in an amount 1.8-fold greater than in the preceding five years.

An increase in the production of machine building goods of up to 43%--1.7-fold greater than as a whole for industry--is planned.

Use of advanced basic technological processes is to increase by a factor of 1.5-2;

The level of production automation will double;

The rates of updating machine building output will have achieved 13% by 1990 (as against 3.1 in 1985);

Some 2.4-fold more computer equipment is planned for production than in the preceding five-year plan, including-- 1.1 million personal computers;

Twice as many funds as in the 11th Five-Year Plan are being allotted for technical reequipment and modernization of existing machine building enterprises.

[Question] You have enumerated various technological processes. What do they have in common?

[Answer] First of all, the fact that they are all low-operation-consuming. For example, to replace the traditional methods of metal working, there are methods of plastic deformation of metals through rolling or pressing. Item transport and machining are combined on rotary lines. Using modern catalysts at chemical production facilities makes it possible to reduce the stage nature of the processes.

Low operation consumption, as is known, usually increases the intensiveness of the production cycle. This means, at the same sites, the product output sharply increases. Low operation consumption reduces the likelihood of malfunctions, while guaranteeing higher reliability and stability for production. This is an indispensable condition for automation and reduction of operational outlays.

The value of these processes lies in the fact that there is little or no waste. This is not only advantageous economically, but also ecologically: environmental pollution is averted and there is an appreciable social benefit. The main thing is that an intrinsic part of modern production systems is becoming electronic.

For example, the present-day machining centers are the "fusion" of modern machine tools and micro-computers. Flexible production modules are newly created on them, and from this--entire sections and shops. Another example-- automated machines with so-called regulated rolling, with the feed-back from the monitoring computer built in to the structure itself.

[Question] Introducing the technology of which you have spoken, though, machines and equipment fitted with electronics--all this is very expensive. Aren't we bringing ruin on ourselves by introducing it? Let us say, that machining center, capable, according to the assigned program, of fulfilling dozens of operations, costs from 100 to 200,000 rubles...

[Answer] Indeed, the ordinary all-purpose machine tool is many times less expensive. But here are two lines of machining centers (of 4-5 pieces each)

on which a flexible production system is built, and, with respect to its productivity, already replaces a large shop with all-purpose machine tools.

True, if these machining centers are used on one or even one and a half shifts, there will be almost no gains. A 24-hour work regime, however, makes them quite efficient with respect to all the economic indicators. It goes without saying, the machining centers should have a high degree of reliability and should operate automatically at night, without people in attendance.

Next, do not forget the indisputable economic law: with series production, the cost of the machining centers will inevitably drop. Metal machining, however, is only one of the areas of application for such technology. We will obtain an even greater benefit in converting to them in the chemical industry and in ferrous metallurgy and other sectors of the national economy.

[Question] Modern technology, you said, arises on the basis of using the newest achievements of the fundamental sciences. Accelerated introduction of their results evidently also requires a certain reorientation of research...

[Answer] Certainly. In giving, as before, priority to the fundamental areas of knowledge, we must increase the role of research collectives, who form the theoretical bases for types of equipment and technology that are new in principle. Advanced organizational forms of integrating science and production will particularly contribute to this.

The first intersectorial scientific-technical complexes (MNTK) were created in our country in December of last year. So far there are about 20 of them, and this, naturally, is only the beginning.

This form of work organization gives MNTK the possibility not only of carrying out research and technical developments, but also of manufacturing models and the first series of equipment, introducing it and licensing it.

At the same time, the network of scientific-production associations (NPO) able to develop and introduce entire technological systems is being expanded. The NPO structure (there are now about 300 of them in the country) includes research subdivisions, planning and design organizations, experimental and series plants, personnel training centers....

The work of the researchers has created a tremendous scientific potential today. There are developments, the introduction of which will make it possible to effect a real turnover in entire sectors of the national economy. Many models of high-efficiency equipment have been made ready. It is only a matter of promoting them on a broad scale in all spheres of the national economy.

The production cost of industrial output is to be reduced by 28.6 billion rubles (as against 16.3 in the preceding five-year plan) as the result of carrying out a set of scientific-technical measures with respect to conserving resources;

Reduce the energy-intensiveness of national income by 8.5%;

Its metal-intensiveness by 14%;

Some 65-70%, and for some types--the entire planned increase in fuel and raw material will be obtained through conserving these resources.

Two-thirds of the increase in labor productivity will be provided in the 12th Five-Year Plan through using the achievements of science and technology;

Expenditures for science will reach 33 billion rubles (without capital input) instead of 24.8 billion in 1985;

The growth rates for expenditures for science will exceed the growth rates for national income by a factor of 1.5;

Capital investments through which the material-technical base of science will be reinforced are to increase by 70%.

[Question] Which "levers" will aid us in being able to solve successfully the problem of technical reequipment for the national economy?

[Answer] First of all, the aid of the investment and structural policy.

Until recently, two-thirds of the capital investments went into new construction and expanding capacities. Only one-third of the resources were left for technical reequipment and modernization of already existing enterprises.

In the present five-year plan this ratio has already changed--fifty-fifty--and in the future the priority will be precisely for modernization.

Here is an example.

Technical-economic substantiation for modernization of the hot rolling lines was developed at the Kuybyshev Metallurgical Plant imeni V.I. Lenin. The outlay will be paid back in approximately two years. This modernization costs about three times less than the construction of a new line. The level of this development in many ways surpasses the achievements of the most prestigious foreign firms.

In addition, there is a redistribution of investments from resource-extracting sectors for the benefit of the resource-saving ones. This approach is fully understandable and justified--today it costs 2-3 times less to save tons of natural resources than to extract them.

Raising the rates of capital investment growth--they will be 4-5-fold above the average formed in other sectors of the national economy--contributes to increasing the role of the country's machine building complex. A Bureau of the USSR Council of Ministers for Machine Building has been created to coordinate the work of all the appropriate ministries.

Success in developing the machine building complex depends on the rates of progress in such extremely important sectors as electrical equipment, instrument making, electronics and computer equipment. Therefore, it is specified that they be developed even more quickly than machine building itself as a whole.

Great changes are also taking place in our fuel-energy complex. Its development is now also coordinated with the corresponding Bureau of the USSR Council of Ministers. Priority here is given to the gas industry, the yearly growth rates of which constitute 6-7 percent.

In a word, capital investments are now concentrated on the units of the economic system which provide the greatest yield and are directed to sectors which ensure to the greatest extent the acceleration of scientific-technical progress. It is precisely because of this that the structure of the national economy that was formed in the period of primarily extensive development has substantially changed. The depth and complexity of processing raw material is increasing sharply, and priority is now being given to new technology and building materials that are new in principle, and it is precisely the science-intensive sectors of industry that are now obtaining outstripping development.

At the same time we are also striving to make our national economic organism acquire greater flexibility and the ability to absorb scientific-technical achievements rapidly. A transition to new methods of administration and management will also contribute to this.

[Question] Could you speak of this in more detail?

[Answer] Our enterprises are now gaining the freedom to be in charge of the profits which they themselves "earn." Administrative methods of management in which the profit was confiscated by the central organs and then redistributed are giving way to measures of economic effect on the course of the production processes, including through bank credit and the direct connections of our socialist market.

The need for this type of reform in our economic system has become urgent. After all, the Soviet Union produces one-fifth of the entire world output. It is no longer possible to manage an economic complex of this scale efficiently only "from the center"--it is really a question of directing the activity of many tens of thousands of enterprises.

It goes without saying, however, this in no way leads to abolishing tried and true methods of planning the socialist economic system. A reasonable combination of centralism and decentralism--this is the essence of this question. What is more, the role of the central planning organs will be strengthened.

It will be strengthened mainly, however--by ensuring the proportional, balanced development of the national economy and the optimum combination of state, sectorial and regional interests. At the same time the planning and central organs will be freed from the petty custodianship of enterprises and associations and from solving problems which the work collectives and their management themselves can solve unaided.

What does the experience already accumulated indicate?

Let us take, for example, the Sumy Machine Building Association imeni M.V. Frunze. Last year its collective succeeded in increasing labor productivity by over 13 percent, and increasing the profits by 32 percent. The interest and activity of all the members of this collective in achieving high production indicators rose. The work of the leader of Soviet motor vehicle building --the Volga Automobile Plant (Tolyatti) has been based, since the beginning of the present five-year plan, on principles of self-financing.

The system of full cost accounting and self-financing, verified at Sumy and at VAZ, signifies a serious step forward in reforming industrial administration.

In the near future, all the enterprises of the Ministry of Chemical and Petroleum Machine Building, as well as several dozen enterprises of other sectors, will convert to a system of self-financing.

I should like to note here, however, the aspect of the present improvement in the economic mechanism.

Expanding the rights of the production collectives and intensifying independence naturally lead to the fact that the enterprises and associations should become profitable and self-paying, and then proceed to self-financing.

In other words, the state, in reducing the degree of centralized intervention in their lives, also "removes" from itself to the same degree the responsibility for the results of the activity of the labor collectives.

Here, for example, is a problem which our enterprises are encountering in this five-year plan. A government decision outlined a 25-30 percent increase in the tariff rates and tax rates in the material production sectors. For the first time, however, this increase will not be made in centralized form: the enterprises operating in the new way should themselves earn the funds for this.

[Question] The last question: could you briefly characterize the essence of the tasks facing us today?

[Answer] I think that it can be conveyed in one word--"turning-point." We must reach a turning point in economic, scientific-technical and social development. The decisive factor here, of course, is the human factor. We will be able to solve the complicated problems of our development if we implement a turning point in the minds and the moods of the people, and if we learn to stimulate them effectively, that is, commensurate with the actual contribution of each worker to the economic system and with the job at each work place, and thus to focus each one toward accelerating scientific-technical progress and interest them in solving this "problem of problems" morally and, of course, materially.

The main goal of Communist Party policy has always been and remains concern for the person and his needs, the satisfaction of his demands and a steady rise in the material and spiritual level of life for the people. The Party links the

achievement of this goal with regeneration of the productive forces on the basis of the highest achievements of science and technology and with improving production relations, the system of management and administration and profound changes in the labor sphere. This is a most important condition of national progress today.

Up to 80% of national income is to be directed toward raising the well-being of the people;

The wages of 90 million workers and employees (as against 20 million in the last five-year plan) will be raised;

More housing and kindergartens, schools, polyclinics and vocational and technical schools are to be constructed in the present five-year plan than in any of the preceding ones;

Some 595 million square meters of housing will be constructed in this five-year plan (by the end of the century--2 billion square meters). Each soviet family will thus obtain a separate apartment or individual house;

The volume of public consumption funds will reach 600 rubles per capita (as against 530 in 1985). They will ensure:

free education

medical service

pensions and grants

student stipends

yearly leave for workers, other payments and benefits.

In concluding our discussion, I should like to emphasize: The strategic line determined by the 27th CPSU Congress in the sphere of scientific-technical progress will undoubtedly provide the possibility to make the economic system of the Soviet Union responsive to constant updating and will help to solve the complex problems of accelerating the social and economic development of our society.

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CSO: 1814/27



## STEPS FOR RADICAL IMPROVEMENT OF PRODUCT QUALITY

Moscow STANDARDTY I KACHESTVO in Russian No 8, Aug 86 pp 3-7

[Excerpt from decree of CPSU Central Committee and USSR Council of Ministers dated 12 May 1986, No 540]

[Text] ... Under present conditions, radical improvement of product quality is one of the key economic and political tasks to implement the course of the 27th CPSU Congress toward acceleration of socioeconomic development of the nation, the most important factor in intensification of the economy for the purpose of fullest satisfaction of the growing needs of the national economy and people.

In recent years, some work has been done in the national economy to raise the technical sophistication, product quality and improve the work that is done. At the same time, the results achieved are not consistent with the tasks set forth.

The sophistication of scientific research, planning-design and technological developments does not always conform to modern scientific engineering requirements and plans for development of the national economy.

Technological and work discipline is not maintained at many associations, enterprises and organizations, where standards and technical conditions are disrupted, there is a poor sophistication of production and great loss due to rejects.

The necessary steps are not being taken to furnish industry with modern equipment, or introduce the newest technological processes that provide for stable output of high-quality products. The quality of consumer goods and domestic services sometimes prompts justified claims by the working people.

The management of ministries and agencies, associations, enterprises and organization has not yet overcome the force of inertia that became established at the time when due attention was not given in planning and evaluation of management to quality indicators, and it does not provide a basic evaluation of instances where technically obsolete and poor quality products are delivered to plants and put out by them.

The existing practice of correlations between developers and requesters, suppliers and consumers does not help raise the technical sophistication and quality of products.

The technical control services of many associations and enterprises are not performing their duties satisfactorily with respect to preventing output of products of poor quality; they are not manned by qualified personnel and do not have modern inspection equipment.

Many workers and specialists, production brigades and worker groups of associations and enterprises still have little responsibility for the quality of products. The system of providing tangible and intangible incentives is not aimed at advancing the professional skill of workers, of instilling in them a feeling of pride in the honor of their plant trade-mark.

The USSR State Committee for Standards is not yet making full use of the rights granted to it in the area of suppressing output of poor quality products; it does not provide a consistency in the standards it sets with the world standards, international standards and projected scientific engineering advances.

The existing system of teaching and training personnel does not conform to the increased requirements as to the professional skills of workers in this time of intensification of industry and acceleration of scientific and technological progress.

The CPSU Central Committee and USSR Council of Ministers hereby resolves:

Communist party central committees of republics, kraykoms, obkoms, okruzhkoms, gorkoms and raykoms [kray, oblast, okrug, city and rayon committees] of the party, councils of ministers of Union and autonomic republics, ministries and agencies, trade-union and Komsomol agencies, associations, enterprises and organizations must deem it their most important practical task at the present stage of socioeconomic development of the nation to implement the decisions of the 27th CPSU Congress pertaining to radical improvement of product quality so that a decisive breakthrough is achieved in this important matter already under the 12th Five-Year Plan.

Improvement of the quality of products and work must become a general party, national and universal goal, the central element in development and implementation of long-term, five-year and annual plans, the subject of constant attention and inspection, the principal factor in assessing the performance of each group of workers.

It must be established that developers in industrial and scientific-production associations, at enterprises, scientific research, planning and design, technological planning and other organizations bear full responsibility, in the area of development or radical updating of machinery and equipment, materials and technological processes, for implementation of proposed requirements of technical sophistication and quality, including resources and reliability consistent with or exceeding the highest worldwide advances, while general (chief) designers must bear personal responsibility for these matters.

Management of associations, enterprises and organizations are to implement the following for the purpose of providing conditions for putting out high-quality products:

Broad introduction of automated planning, modeling, esthetic design and other progressive methods of developing new prototypes of industrial goods, consumer goods, materials and technological processes.

Establish a mandatory procedure for comprehensive testing, including tests under conditions that are as close as possible to actual operating conditions.

Development and execution on a priority basis of tasks dealing with development and technical re-equipment of research-laboratory and experimental design bases of associations, enterprises and organizations.

The USSR State Committee for Science and Technology is to be charged with implementation in 1986-1987, together with the USSR Academy of Sciences, USSR State Committee for Inventions and Discoveries, ministries and agencies, radical alteration of the operation of all information-furnishing organizations and services, for the purpose of establishing an efficient information system in the nation to supply developers and other concerned organizations with continuous and purposeful information as needed about the latest advances and trends in development of the relevant directions of Soviet and foreign science and technology.

Granting the right to developers of end products to establish the mandatory specifications for developers of materials and component parts of products with regard to technical sophistication, resource, reliability and quality of these parts and materials, as well as types, scope and methods of testing them. Customer requirements are mandatory for developers of materials and components.

Establishment of the fact that the developer assumes guarantee obligations to the product manufacturer for the technical documentation transmitted to the plant and conformity of the developed item to specifications.

It is to be deemed desirable, for the purpose of increasing moral interest and public recognition of authors of developments that have utmost importance to the national economy, to name after such developers basically new types of products, technological processes, as well as consumer goods.

Ministries and agencies, associations and enterprises are charged to develop in 1986 special-purpose scientific engineering programs to improve the quality and reliability of products in 1986-1990 and in the period up to 2000, providing the following in them:

Forecasts of technical sophistication indicators and quality of the most important types of products, with consideration of requirements of international standards to render the products competitive.

Development of basic and applied research on problems of quality and reliability.

Development and introduction to practice of modern methods of estimation, design, modeling and designer developments that would guarantee a high quality and reliability.

Development of testing, diagnostic and inspection-measurement equipment.

Appreciable expansion of the scope of using test benches to optimize products.

Development of documentation pertaining to standards and specifications that establishes the anticipatory levels of requirements of products, organization and scope of testing.

Metrological provisions for work at the stages of research, development, production and operation, for which purpose there must be drastic increase in scale of production of automated inspection and measurement equipment, including equipment built into the technological process.

Interbranch scientific technical complexes must be called upon to participate in development and implementation of these special programs.

The USSR State Committee for Science and Technology, USSR Gosplan and USSR Academy of Sciences must, within the limits of their competence, take the necessary steps related to development and implementation of special-purpose scientific-technical programs in different sectors and, for matters that require decisions by superior agencies, to submit the appropriate proposals to the USSR Council of Ministers.

It must be established that the most important task for worker groups of associations, enterprises and organizations is to assure the output of products of high technical sophistication, quality, resource and reliability by accelerating appreciably the assimilation in production of promising design developments, progressive technological processes, latest materials and to introduce extensively scientific-technical achievements.

The USSR State Committee for Science and Technology, together with ministries and agencies, must sum up the knowhow of the Institute of Electric Welding of the Ukrainian Academy of Sciences, the Uralmash Production Association of the Ministry of Heavy and Transport Machine Building, All-Union Kriotehnika Scientific Production Association of the Ministry of Chemical and Petroleum Machine Building, other associations, enterprises and organizations that have achieved significant results in improving the technical sophistication of production to put out modern high-quality products, and to prepare proposals on dissemination of this knowhow.

Ministries and agencies, associations and enterprises preparing special-purpose scientific-technical programs must pay special attention to improving the technical sophistication of production, providing for the following in these programs:

Broad introduction of automated systems for control and monitoring of technological processes.

Substantial growth in share of progressive types of procurement.

Drastic increase in modern basic technological processes, which would increase by many times labor productivity and radically improve product quality.

Overtaking development of capacities of shops dealing with production of modern types of tools and technological outfitting, and the complex of services dealing with preparation of production.

Priority outfitting with new types of equipment for finishing operations.

Remodeling and technical retooling of existing industrial enterprises, as well as construction of new ones, solely on the basis of plans that provide for use of modern technological processes and equipment, progressive forms of organizing production and labor.

Ministries and agencies, associations, enterprises and organizations are to develop and implement joint work plans to solve concrete problems for the purpose of effecting a single technological policy when retooling industry for output of high-quality products and their component parts and materials.

Ministries and agencies, associations, enterprises and organizations are to analyze technological processes, the condition of equipment and tools, in certifying work places, and to take the necessary steps to assure a stable quality of products.

The CPSU Central Committee and USSR Council of Ministers believe that it is the direct duty of each collective, each worker, specialist and administrator to solve the problem of radically improving product quality. The struggle to improve product quality should become routine in the everyday life of worker collectives.

Associations, enterprises and organizations must bear full responsibility for product quality, its competitiveness on the world market, and conformity of new products and materials to the most rigid requirements that assure scientific and technological progress. The indicators of technical sophistication and product quality should become deciding elements in assessing the results of their managerial activity, while the size of the economic incentive funds should depend primarily on its quality.

It should be established that the sums of money demanded of associations and enterprises in the form of sanctions for producing and delivering products of a poor quality and as compensation for losses sustained by the product consumer are to be applied to the share of profit intended to form the funds for economic incentives of associations, enterprises and organizations.

Production organizers on all levels, from association, enterprise and organization administrators to foremen, must be made personally responsible for putting out products of poor quality. One should proceed from the fact that consistent output of products that do not meet standards and technical conditions is indicative of inadequate professional training of production administrators in carrying out their duties, their inadequacy for the position they hold.

Associations and enterprises must bear greater responsibility to the customers, and consider satisfaction of their demands as to product quality to be the first and foremost task. Customers are to display principle-mindedness and persistence.

It must be established that, in the case of repeated delivery of products of poor quality, the consumer has the right to unilaterally break an agreement with the supplier, having given him at least 1-month notice, in order to increase the influence of consumers on the quality of delivered products. The supplier must then slow down or stop manufacturing the product in question and reimburse the customer for the loss sustained as a result of cancelling the agreement.

For the purpose of strengthening the role of technical control services in improving quality, a reliable barrier must be erected on the route of output of poor-quality products to administrators of ministries and agencies, associations and enterprises; the work of technical control services must be re-organized, effecting a set of organizational, economic and educational measures for this purpose.

Every support must be given to an active and uncompromising stand taken by technical control services to detect and prevent defective products and infractions of technological discipline; the authority of workers in the control system who perform an honorable and responsible duty to protect the interests of the government and integrity of the plant trade-mark must be increased in worker collectives.

The technical control service must be reinforced with highly-qualified, principle-minded and exacting workers.

Workers with the required experience in production work and profound professional knowledge should be called upon on a broader basis to such services.

Technical control services must be better supplied with modern inspection and testing equipment.

In view of the fact that the main task for technical control services is to prevent output of products that do not conform to standards and specifications, the workers of such services must effect the following:

Wage a decisive war against individuals who put out defective products and infract technological discipline.

Not allow reduction of the established extent of inspection and testing to assure the output of high-quality products.

Promptly inform the chief of an association or enterprise of consistent output of poor-quality products, infraction of technological processes and specifications, as well as of delivery to the association or enterprise of poor-quality products from suppliers.

Regularly analyze the causes of putting out poor-quality products and offer the necessary suggestions to management and production departments of enterprises to take steps to eliminate them.

The chiefs of technical control services must have the right to stop pre-acceptance inspections at any stage of production or to temporarily stop delivery of finished products to consumers until steps are taken, in cases of infraction of technological processes or nonconformity of products to established requirements.

It is to be deemed necessary to introduce in all associations and enterprises the practice of testing incoming component parts, materials and semifinished products, assigning this duty to technical control services. For this purpose, special departments of external acceptance must be set up in technical control services, and they should be equipped with the necessary inspection and testing equipment.

Raw materials, materials, semifinished products and component parts that do not conform to standards and specifications according to the results of the receiving inspection should not be issued or used in production.

Ministries and agencies, associations and enterprises that deliver raw materials, materials and component parts must take immediate and exhaustive steps to assure the output of good products with consideration of the results of the receiving inspection by consumers.

The Gosstab of the USSR, ministries and agencies must not allow substitution of supplier of raw materials, materials, semifinished products and component parts until the consumer has obtained positive results from testing them.

It is to be deemed mandatory to change the system of paying wages and bonuses to employees of technical control services, without tying in their salaries with the results of management of associations and enterprises. The quality of products that are put out should become the only criterion for evaluating their work.

It is to be deemed necessary to establish a special body of extra-agency control, the State acceptance office, for the purpose of radically improving product quality, acceptance of finished products and monitoring the performance of associations and enterprises in the area of problems of quality.

This office should be under the jurisdiction of the USSR State Committee for Standards.

The role and responsibility of the above-mentioned committee must be strengthened for implementation of a unified state policy in matters of product quality.

The USSR State Committee for Standards must implement the following:

Coordination of work of ministries and agencies aimed at achievement of stable indicators of quality and reliability, high technical sophistication of products.

Active influence on technical sophistication and product quality by means of regular upgrading of standards and bring up their specifications to the level of international standards.

Constant analysis of performance of associations, enterprises and organizations in the area of improving product quality and, together with ministries and agencies, taking the necessary steps to suppress output of poor-quality products making full use of the rights granted to the Committee.

High efficiency of performance of State acceptance offices.

Improvement of state system of standardization and metrology, increased effectiveness of state supervision of introduction and adherence to standards and specifications.

Broad involvement, together with ministries and agencies, in the work of international organizations dealing with standardization.

Considering the fact that State certification of industrial products is an important economic lever in the control of quality, the USSR State Committee for Standards, USSR State Committee for Science and Technology, ministries and agencies must offer greater objectivity in assessing the technical sophistication and product quality when implementing such certification. Steps must be taken to improve selection of specialists called upon to work in State certification commissions. There must be strict control over the work of certification commissions, they must be made more responsible for the performance of duties assigned to them and proper use of granted rights. The chairman of a state certification commission must be made personally responsible for objective assessment of products submitted for certification.

In view of the fact that the problem of improving quality is complex and multifaceted, administrators on all levels, from minister to foreman, must be familiar with modern requirements for development and manufacture of high-quality products. Ministries and agencies, associations, enterprises and organizations must radically revise the system of training, retraining and advanced training of personnel. There must be planned and continuous implementation of advanced training of workers and specialists so that their professional competence would conform to the constantly rising sophistication of equipment and technology.

The forms of training that have proven themselves must be used extensively, primarily course for special-purpose training, classes dealing with advanced procedures and methods of working, circles and seminars.

Newly hired blue-collar workers, engineering and technical personnel must be routinely trained in the area of distinctions of technological and work



processes, and they must be informed in detail about the specifications as to quality of products manufactured and work performed. When changing to new technological processes and setting up new types of production, workers must receive training, and this should be considered an important element of preparing for production. The qualification level of workers (classes, categories) should be promoted only after they have attended appropriate training classes.

In 1986-1987, universal education must be provided for blue-collar workers, engineering and technical personnel in the area of quality.

Ministries and agencies must increase their exactingness of administrators of associations and enterprises in the matter of improving training, retraining and advanced training of personnel.

In 1986-1987, the USSR Ministry of Higher and Secondary Specialized Education, Academy of the National Economy under the USSR Council of Ministers, the USSR State Committee for Vocational and Technical Education, councils of ministers of Union republics, ministries and agencies are to add the study of engineering, economic and legal problems of improving product quality and prepare the necessary textbooks for the syllabuses of higher and secondary specialized educational establishments, vocational technical schools, as well as institutions for advanced training of specialists and workers. Training of personnel must provide for in-depth modern knowledge and skill in methods of developing and manufacturing high-quality products. There must be expansion, in special departments of existing higher educational establishments, of retraining and advanced training upon request by ministries and agencies for specialists of associations and enterprises in important problems of improving product quality.

It should be deemed expedient to establish, in associations and enterprises, in shops and sectors, quality [control] groups as forms of concrete involvement, active impact of all workers in the area of improving in every possible way the quality of manufactured products and work, imparting to this the nature of a mass social movement, for the purpose of broader involvement of working people in solving problems of improving quality and upgrading production.

Administrators of associations, enterprises and organizations, together with trade-union organizations, should guide the activity of quality groups primarily in the direction of preparing and introducing proposals to improve quality, refine technological processes, organization of labor and production. Selection of qualified administrators with initiative must be implemented for these groups. Members of quality groups should undergo regular training, and engineers must support them comprehensively in their work. Various forms of material and moral incentives should be used for active members of quality groups. There should be extensive and convincing campaigning on the importance and significance of the work done by quality groups, and special attention should be devoted to publicizing and demonstrating their work.

It should be established that administrators of associations, enterprises and their structural departments bear responsibility for providing the appropriate

conditions for the creative work of quality groups, as well as prompt consideration of proposals of workers and regular notification of implementation of their suggestions.

Administrators of associations and enterprises, party and trade-union committees are to effect the following:

a) Broader use of the capacities of the brigade form of organizing work to improve product quality, intensify the role of collectives of brigades, councils of brigades and councils of brigade leaders in this matter. Not a single case of infraction of technological discipline and manufacture of low-grade products should remain without the attention of the brigade collective, while slipshod workers must suffer the appropriate material and moral punishment. Consideration must be given to the quality of performance of each brigade member when determining the index of participation in the work.

It is deemed necessary for the production brigade to bear collective responsibility for the manufacture of poor products and compensation for the loss from the earnings of the brigade and, when they are distributed, to take into consideration the specific fault of individual workers.

b) Implement introduction of the knowhow of the AvtoVAZ Association and other progressive enterprises in the area of certification of parts, units, assemblies for the plant seal of quality. Brigade collectives who produce items with this seal and who have achieved flawless work should be given the title of "Brigade of Excellent Quality," and they should be granted the right to work with the brigade quality stamp. Higher bonuses should be set for such groups.

The recommendation should be given to administrators, enterprises and organizations that they take into consideration primarily the quality of performance and adherence to technological discipline in setting bonuses for workers for high professional skill, extra pay to foremen and other engineering and technical personnel for high production achievements, for the purpose of increasing the interest and responsibility of workers for the quality of manufactured products and work performed. Additional payments and bonuses are not issued for a month in which there were instances of defective products or poorer production. In the case of defective products or appreciable worsening of product quality, such bonuses are canceled entirely.

It is to be deemed expedient to intensify material responsibility for the loss sustained by an enterprises due to blue- and white-collar workers in their performance of their work duties as a result of manufacturing poor products, spoilage or destruction due to negligence of materials, products, intermediate products and other products.

Administrators of associations, enterprises and organizations should be given the right to lower for up to 3 months the qualification ranking (class, category) of workers for gross infraction of technological discipline, as well

as other serious infractions leading to worsening of the quality of the product they manufacture. Restoration of their grade (class, category) is effected following the procedure established for promotions.

In organizing socialist competitions, attention must be devoted primarily to radical improvement of product quality, successful fulfillment and overfulfillment of planned assignments and obligations to augment the output of products of the highest quality, with new types of materials, machinery, equipment, producing high-grade merchandise for the public.

Individual and collective forms of socialist competition, which have proven themselves in practice, should be developed, using them to achieve a high quality of work, propaganda and dissemination of advanced work procedures and methods. Competitions should be organized between related brigades, shops, sectors, associations and enterprises on the principle of a "workers' relay-race." The role of contests for the title of "Best in His Profession" must be raised.

The work of brigades of creative collaboration of blue-collar workers, engineering and technical personnel must be activated in the area of solving concrete problems of improving product quality at all stages of development and production.

NTO [scientific and technical society] and VOIR [All-Union Society of Inventors and Efficiency Experts] organizations of enterprises, associations and organizations must provide for the broad involvement of outstanding production workers, the scientific and technical community in solving concrete problems of radical improvement of product quality. Contests and reviews must be held for best organization of such work. Maximum use should be made of the proposals of inventors and efficiency experts in the matter of improving product quality.

Five USSR State Prizes must be additionally available to encourage collectives of production and scientific-production associations, enterprises, scientific research, planning and design and technological design organizations, for outstanding achievements in the matter of radical improvement of the quality of products and consumer goods that are of the utmost significance to the national economy.

Ten prizes of the USSR Council of Ministers in amounts of 15,000 to 20,000 rubles should be instituted for achievement of a stable high quality of manufactured products by production worker collectives.

The USSR State Committee for Television and Radio Broadcasting, editorial boards of newspapers and periodicals, together with the USSR State Committee for Inventions and Discoveries and the USSR State Committee for Standards should publicize extensively the knowhow of collectives, associations, enterprises and organizations, outstanding workers in production, quality groups, technical control services, offices of State acceptance, party, soviet, trade-union and Komsomol organizations in providing high indicators of product quality for the national economy and public; while slipshod workers and those who infract the standards, technological conditions and technological discipline should be submitted to harsh criticism.

The USSR State Committee for Science and Technology, Exhibition of Achievements of the National Economy of the USSR, together with USSR ministries and agencies and councils of ministers of Union republics, are to intensify publicizing of advanced knowhow in the area of raising the technical level and quality of products.

The USSR State Committee for Publishing Houses, Printing Plants and the Book Trade and USSR State Committee for Standards must take steps for considerable increase in publication of the scientific and popular science literature dealing with problems of quality, standardization and metrology.

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The Central Committee of the CPSU and USSR Council of Ministers express their confidence in the fact that blue- and white-collar workers, scientists, engineering and technical personnel of associations, enterprises, scientific research, planning and design, technological design and other organizations will do all that is necessary to successfully implement tasks dealing with radical improvement of the quality of products and work.

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## ROLE OF STANDARDIZATION IN ACCELERATING S&amp;T PROGRESS

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[Article by V.P. Blinov under the rubric "Problems, Theory, Methods of Standardization": "Increase the Role of Standardization in Accelerating Scientific and Technical Progress"]

[Text] In modern industry, documentation referable to standards and specifications (NTD [technical standards documentation]) has become an inseparable element of design and engineering.

State and sector standards control virtually all aspects of production work, from concrete specifications to technological execution of products and their parts, methods of designing, producing and testing, to technical organizational questions of controlling the quality of manufactured products and improving the efficiency of production. This provides unity of technical policies in modern industrial designing and production, which is characterized, on the one hand, by the constant increase in products lists, increased complexity and growth of requirements of the finished product, broad cooperation of enterprises referable to developers and manufacturers in different sectors of industry and, on the other hand, limitation of funds, terms and all types of resources to cover the design and manufacture of new equipment.

Apparently, under such conditions, the requirements as to proper formulation of norms, rules and indicators contained in NTD must be rather high in order to conform to the requirements of scientific and technological progress, and they should be rather stable in time and actual feasibility of achievement by industry. Also, the requirements are growing for coordination, absence of duplication and parallelism of individual items and NTD, lack of ambiguity and contradiction in formulating interrelated rules and requirements.

Unfortunately, the practice of using standards and specifications in developing and producing goods under the 10th and 11th five-year plans has revealed a number of flaws and costs related to defective methodology of forming and managing the NTD fund.

There are instances of duplication and parallelism in the effect of NTD, as well as individual NTD requirements referable to a number of items subject to standardization. This applies, first of all, to widely used items (brackets, pipe connections, valves, etc.), technology and means of technological outfitting,

which causes growth of products lists with items of the same type at manufacturing plants and operational organizations.

Several state and sector standards contain contradictory theses and requirements. This applies, first of all, to standards that define the procedure for elaborating and coordinating documentation, requirements of programs to assure reliability, procedure for conducting tests and evaluating their results. The absence of uniformity in designating materials in different state standards prompts justified complaints on the part of developers and technological services of enterprises, etc.

The instability and frequent changes in specifications of YeSKD [unified system of design documentation] and YeSTD [unified system of technological documentation] in the area of graphic illustrations of elements of designs, roughness of surface, indications of allowances in form and location of surface, etc., lead to numerous changes in design and technological documentation for virtually all products, they cause major nonproduction expenses, prolong duration of their development and start of production, having no influence at all on the scientific and technical quality of these products.

Many standards, particularly organizational-methodological and general technological ones, of the SRPP [Printing Industry Workers' Union], KSOTT [expansion unknown], YeSKK [unified system of classifying literature for USSR book publication] systems and a number of other documents contain superfluous specifications that offer no concrete information or establish petty supervision of developers and manufacturers of new products, thus inhibiting their initiative.

In our opinion, the main cause of the existing situation is the build-up under the 10th and 11th five-year plans of the NTD fund referable to related objects of standardization in different sectors of industry without the appropriate systems approach and consideration of the properties and distinctions of integrated standardization product--the state (sector) NTD fund.

A separate problem of major importance, which arises due to the rift between work dealing with development and production of new items and methodology for standardizing them (planning, development and introduction of NTD) is to provide a high scientific and technical level for the NTD that are being developed and revised, so that they conform to the worldwide level and specifications imposed on future products.

The objectives of dramatically accelerating scientific and technological progress require adoption of new progressive methods of quality control of the NTD used that would prevent and preclude the causes of the above-mentioned and other flaws and provide constant conformity of the technical standards base to the requirements of scientific and technological progress.

These methods must be based on the organic union and physical merging of work dealing with development and standardization of future products, means and methods of producing them and controlling these processes.

Such an approach is possible only if standardization is viewed as a means of depersonalizing group design of products and developing standard processes for

control of development, production and refinement of new equipment, finishing with elaboration of NTD for a group of similar products, unlike the design of concrete items which ends with development of a set of design documents for the product. Depersonalization of group design should be construed as development of both individual items to be used on a mass scale in numerous future samples of various types of equipment, and development of group technological design, technico-economic and operating requirements, implementation of which is mandatory for each item in this homogeneous (according to features selected from the ones listed) group of products.

This conception of standardization makes it possible to do the following:

Examine and investigate the mechanism of NTD effect on formation of the level of quality and technico-economic characteristics of items in different stages of their development and refinement.

Demonstrate patterns of formation of different requirements and NTD arrays for groups of homogeneous products.

Introduction to methodology and practice of work dealing with standardization of progressive methods for designing with the use of computers.

In our opinion, the following are the priority tasks to improve the effectiveness of standardization, which ensue from analysis of the existing situation and tasks defined in the decisions of the 27th CPSU Congress and implementation of which is possible with consideration of the proposed methodological approach:

1. Development of model and methodology for accelerated introduction through NTD of achievements referable to scientific and technological progress (results of work pertaining to inventions, optimization, NIOKR [scientific research and experimental design work], progressive knowhow) into products and production.
2. Investigation of properties of the object of control in the standardization system--fund of NTD--and elaborate criteria to assess its conformity to the requirements stipulated by the consumers of the items and products of the sector.
3. Development and introduction of promising forms and methods of elaborating NTD and management of their fund with use of computers, including development of SAPR-NTD [computer-aided design system--NTD].

We shall now discuss each of the above problems in order.

#### Models and Methodology of Accelerated Introduction of Achievements of NTP [Scientific and Technological Progress] Through Standards

One of the elements of the strategy of controlling scientific and technological progress elaborated by the party is the need to "...provide latitude for mass-scale use of reliable technical innovations that have been tested in practice, for the purpose of obtaining a maximum return before they become obsolete"

(Footnote)(N. I. Ryzhkov, "Ob osnovnykh napravleniyakh ekonomicheskogo i sotsialnogo razvitiya SSSR na 1986-1990 gody i na period do 2000 goda" [Basic

Directions of Economic and Social Development of the USSR in 1986-1990 and the Period up to the Year 2000], Moscow, Izdatelstvo politicheskoy literatury [Political Literature Publishing House], 1986, p 25).

Under such conditions, standardization should provide for comprehensive acceleration of introduction of achievements of scientific and technological progress through NTD with reference to products and production. For this purpose, work is in progress to change from retrospective standardization, which regulates the existing diversity of standards, rules and specifications, to standardization that establishes future indicators and specifications. One should select an approach that not result in having the new methodology for development of standards with future specifications become a self-contained superstructure over the procedure for developing and setting up series production of new items; rather, that it would physically merge with it and be combined with the existing tools for economic incentives.

The following is needed to expedite introduction of scientific and technological progress through NTD by means of selection of objects of standardization:

In the first place, criteria must be elaborated for relating the results of NIOKR, inventions and optimization to standardization objects.

In the second place, methodology and organizational forms of elaborating NTD must be developed in relation to the logical order of stages of scientific research and experimental design work (research--testing of results--introduction).

And, unlike the existing practice of using inventions to evolve standards (see RD [expansion unknown] 50-65-80), the approach must differ from the existing one and proceed from the results of NIOKR and inventions to the standard, i.e., consolidating through NTD the advances of scientific and technological progress, rather than going from the standard to the invention, i.e., consideration in evolving the standard the existing author certificates and patents for inventions, and in our opinion this would provide for the following:

Constant tracking over the entire front of positive results of scientific research and experimental design work, inventions and optimization of objects of standardization, and broad, accelerated introduction thereof through NTD to industry.

Effective and optimum combination of innovativeness and conservatism, in accordance with the requirements of the present stage of scientific and technological progress, by means of compulsory introduction through NTD of the entire block of achievements of science and technology, which is the object of standardization.

Conformity of NTD fund to the worldwide scientific and technological level and, consequently, removal from the agenda of the criterion of conformity of the object of standardization to the current scientific and technological level at the stage of development and approval of NTD.

Restricted use of new developments as an expedient set of the most promising and effective ones, by eliminating original ones that have no potential wide-scale application in industry.



The following must become criteria for selection of objects of standardization from the many technical developments (TR) with the same functional purpose, obtained from the results of NIOKR, inventions, optimization and progressive knowhow:

Stability in time.

Scope of use in goods and industry (applicability and reproducibility).

Practical feasibility within acceptable periods of time (choice of optimum between the desired and actually achievable level of requirements).

Let us consider, as an example, a certain set of TR, each of which can be used in M different potential products.

The stability of TR in time is determined by time before it becomes outdated  $t_{M.C}$  and depends on the rate of scientific and technological progress in development of the object in question.

The stability standard can be taken to be equal to the standard time of reimbursement of the new equipment (at the present time it is 6.6 years). When selecting objects of standardization, one should adhere to the condition,  $t_{M.C} \geq 6.6$  years.

The applicability and reproducibility of TR are determined by the quantity of items in which it is used (M), annual output of items ( $b_i$ ) and how many times TR is repeated in the same item ( $n_i$ ).

The feasibility of realizing TR is characterized by the time of its introduction into items, which in the general case includes time spent on NIR [scientific research work] to unify parameters of TR, elaboration of standards, work to develop new technologies and equipment required for use of TR, etc.

A mandatory condition for realization of TR in the  $i$ th item is that work on its introduction must end before the start of series production of the item, i.e.,  $t_{BH} \leq t_{\Pi p i}^0$ , where  $t_{\Pi p i}^0$  is the time at which production of the  $i$ th item starts and  $t_{BH}$  is the time of completion of introduction work.

The total number of applications of TR in different items over the entire period of their production will be:

$$B = \sum_{i=1}^M T_{\Pi p i} b_i n_i,$$

where  $T_{\Pi p i}$  is duration of use of TR in  $i$ th item.

Generalized criterion B takes into consideration stability, applicability, repetition and realization of TR.

If we were to use  $t_{\Pi p i}^K$  to designate the time that the  $i$ th item is removed from production, with consideration of realization of TR we shall have:

$$T_{np i} = \begin{cases} t_{np i}^k - t_{np i}^0, & \text{if } t_{BH} < t_{np i}^0, \\ 0, & \text{if } t_{BH} > t_{np i}^0, \\ 0, & \text{if } t_{BH} \geq t_{M. c.} \end{cases}$$

For comparative evaluation of different TR according to efficacy of their use as standards, one must consider, in addition to stability, applicability and feasibility, their complexity, importance economy and other technical and economical parameters. In general they can be assessed by the expenses to realize TR ( $C_{tr}$ ).

One can estimate the optimum  $C_{tr}$  expenses by methods of functional-cost analysis.

The final criterion for choosing an object of standardization will have the following appearance:

$$K = BC_{tr}$$

This criterion permits not only selection of objects of standardization, but optimization of the composition of specifications in a concrete standard, control of the NTD fund and validation of SAPR.

Under the 11th Five-Year Plan, a number of positive results of NIOKR were introduced through standards and engineering guidelines, which permitted considerable reduction and acceleration of time of introduction to production of achievements of scientific and technological progress.

However, wide enough use of this progress form of introduction of results of NIR is being held back due to the lack of a flexible methodology for conducting such work, which would provide for the following:

Selection of future objects of standardization at the stage of NIOKR planning and decision making as to introduction of results through NTD at the completion stage.

Accelerated development of NTD as part of NIOKR (concurrently with report) or according to NIOKR results.

Elaboration as part of NIOKR of measures, including material and technical provisions, for broad industrial introduction of results of the work.

Incentives for developers for acceleration and broad industrial introduction of NIOKR results through NTD.

Organic coordination of NIOKR plans with standardization plans should be the basis for developing such methodology.

Without such coordination, as well as without knowledge of the distinctions and characteristics of the engineering prototypes being developed, time and stages of their development and setting up series production, it is difficult to fulfill the main objective of standardization, prompt furnishing of proper NTD for design, refinement and production processes, including development of new NTD and revision of existing ones for the generation of future promising items.

In addition to development of models and methodological bases for introduction of achievements of scientific and technological progress through NTD to items and production, it is necessary to examine the question of economic incentives for executors of NIOKR and authors of inventions and optimization proposals for acceleration and the scale of introduction of results obtained through NTD. Perhaps, this can be organized in such a way as to remit rewards to authors after introduction of results of NIR, inventions and optimization proposals in NTD, or at least to set the size of the reward as a function of this.

#### Forms and Methods of Controlling the Structure of the NTD Block

An important direction of work dealing with improvement of the effectiveness of standardization at the present stage of scientific and technological progress is to refine the methods and forms of controlling the structure and composition of the NTD block used.

At the present time, the NTD fund is, on the one hand, a reflection of many isolated indicators of standardization: norms, characteristics, specifications and rules, which are repeated several times in reality and are rather stable for a certain time, and, on the other hand, the formal structure of the NTD fund could be represented by a set, the elements of which (standards) are characterized by four external tags: area of distribution, area of action, object of standardization and type of standard.

With regard to area of distribution, all standards can be classified on the following levels: all engineering, machine building and instrument building, types of equipment, functional components, component elements, raw materials and material.

The area of NTD action is determined by the stage of the life cycle of industrial production at which a given NTD is introduced and has a direct effect on its technico-economic and quality characteristics.

Objects of standardization are tangible objects of industrial production, as well as ancillary requirements that provide and service the required level of quality, technico-economic characteristics of items and processes in their manufacture and refinement (norms, rules, terms, specifications, designations, etc.). Objects of standardization and types of standards are defined in GOST [All-Union State Standard] 1.0-85.

In addition, each standard is characterized by a number of internal parameters. They include the technical level [sophistication] (quantitative or qualitative) of standardized norms, rules and specifications, their potentiality, stability, fullness and adequacy.

The structure of the set of specifications stipulated by the NTD fund used in the sector can be represented in the form of the following model (Figure 1), which permits the following:

Imposition of standardization parameters on tangible objects, which are the objects of design and production coordinated with the stages of the life cycle of the items.

Examination of the mechanism of operation of different types of NTD and functions they perform at concrete stages of development and production of items.

Provide conditions for elaboration of guidelines and conditions (criteria) for optimum separation of the set of isolated standardization parameters into a set of NTD which preclude intersection and duplication of specifications in documents for different areas of distribution and objects of standardization, since the structure model is based on the principle of reflection of actually existing hierarchy for subdivision and subordination of specifications from engineering to materials.

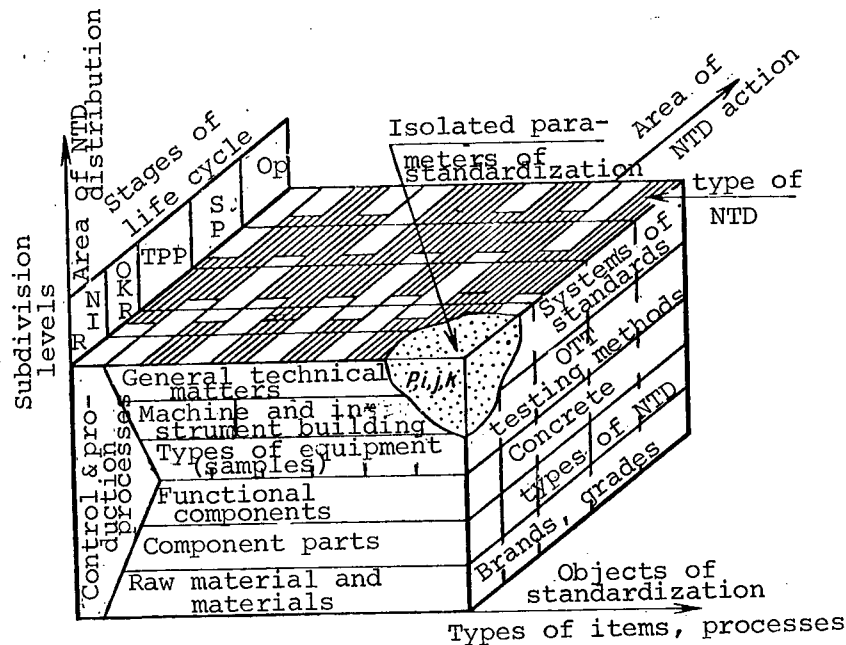


Figure 1.

Key: NIR) scientific research work      SP) series production  
 OKR) experimental design work      Op) operation  
 TPP) technological preparation of production      OTT) basic technical requirements

Considering the principle of construction, "from the general to the particular," for each level of subdivision we must determine the list of requirements subject to standardization, which would not be duplicated by the next levels above and below. In the general case, expressing the set of individual parameters of standardization as  $P_{i,j,k}$  ( $i$ th type,  $j$ th level of subdivision,  $k$ th

life cycle), we can write down the condition of absence of duplication in the NTD fund for any subset:

$$P, i_1, j_1, k_1 \cap P, i_2, j_2, k_2 = \emptyset$$

for different NTD.

One could choose the YeSKD [Unified System of Design Documentation] classifier (for objects of design) and OKP (Unionwide classifier of industrial and agricultural products) (for raw material, materials, and semifinished products) as a tool that permits separation of objects into homogeneous groups of products according to levels of subdivision.

The proposed model of the structure of NTD fund is indicative of the need to control the integral product of standardization--state (sector) fund of NTD (system of entire complex of intercoordinated parameters of standardization)--as the only means that prevents the above-mentioned costs.

The dynamic task of controlling the NTD block amounts to detection and use of patterns of optimum distribution of the set of requirements and parameters in the set of NTD with consideration of their above-mentioned tags and period of time before the objects of standardization become outdated.

Performance of this task requires elaboration of criteria for evaluating the conformity of qualitative and quantitative characteristics of the NTD fund to requirements on the parts of consumers of products and industrial potential of sectors of the national economy, investigation of its systemic properties and distinctions, that distinguish its effective use from use of individual NTD. This would provide the move from elaboration of individual NTD to the design of blocks of documents (on groups of homogeneous products--types of equipment--sector of national economy).

Systematization and organization of requirements of the NTD fund are particularly important at the present time, when work is being started on large-scale automation of design and production processes, and it is very important at the start of such work to put into the automated data banks the proper technical standards provisions, which would preclude the unwarranted growth in list of component parts of products in production and operation.

#### SAPR-NTD--The Modern Way to Improve Effectiveness of Standardization

Extensive automation of design and production processes, automated preparation of design, technological and program documentation impose qualitatively new requirements of the technical standards and NTD as the component of specifications and technical documentation of computerized design.

Figure 2 illustrates existing automated systems at different stages of the production cycle of an item, their informative connections and succession of automated data banks.

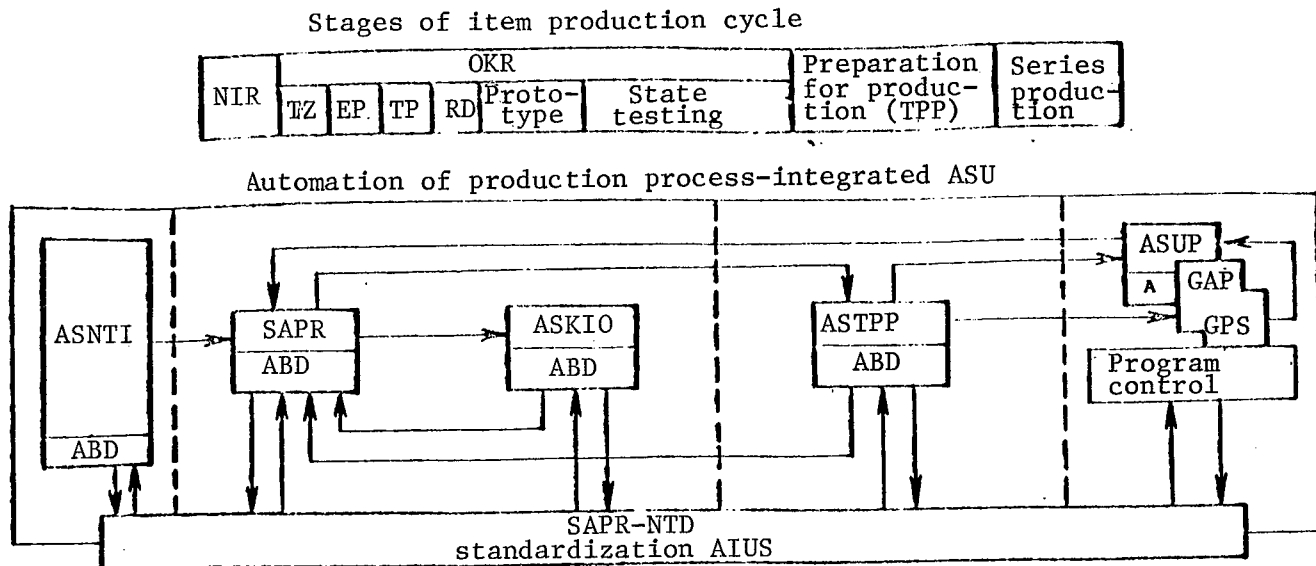


Figure 2.

Key:

- NIR) scientific research work
- OKR) experimental design work
- TZ) technical task
- RD & EP) expansion unknown
- TP) technical regulations
- ASNTI) automated systems for scientific and technical information
- ASU) automated control system
- ABD) automated data bank
- SAPR) computer-aided design system
- ASTPP) automated system for technological preparation of production
- ASKIO) automated system of monitoring information support
- ASUP) automated enterprise management system
- GAP) flexible machine system
- GPS) FMS-type production system
- AIUS) automated information-controlling system

It is quite apparent that standard items, elements and requirements stipulated in technical standards documents are the basis for forming automated data banks (ABD) for each of the automated systems. Otherwise, random and arbitrary formation of ABD on SAPR and, consequently, on other automated systems that follow in the production cycle of the product would lead to uncontrollable growth in product list, with which no production system, whatever its flexibility (adjustability), could cope.

Under such conditions, there is the principal requirement of NTD, which is adaptation to computer design of items and processes.

The block of future standards is primarily an element of the automated data bank and control programs of integrated ASU [automated control systems]. It must conform to the following principal requirements:

It must adequately reflect the current status of worldwide scientific and technological sophistication of production and products.

It must provide for complexity and fullness of interrelated requirements.

It must be notable for a high degree of formalization of requirements.

It must guarantee that there will be no duplication or contradiction.

This is obtained by developing automated planning of technical standards documents of SAPR-NTD with use of the previously proposed approach to standardization as a method of depersonalized design and control of the qualitative characteristics and processes of production.

This methodological approach permits consideration of SAPR-NTD in integrated ASU as the source of formation of the main element of ABD and as a subsystem in the standardization AIUS [automated information-controlling system] on all levels of control.

One of the mandatory, objectively existing conditions is the strict orderliness and specifics of information contained in NTD, as expressed by a high degree of its formalization:

The standard must contain a set of requirements that are necessary and sufficient for its effective application in accordance with its functional purpose (condition of fullness and sufficiency).

Requirements stipulated by the standard must be entirely coordinated with those established in other standards referable to the object of standardization (condition of mutual lack of contradictory information).

It is not allowed to repeat entirely or in part (to quote) in standards the contents of other standards that extend to the same object of standardization (but this rule does not extend to limiting standards).

The norms (indicators) set by the standard must be given with maximum or allowable deviations, or else they must be indicated in the form of maximum or minimum values (range of allowable values).

The text of the standard must be concise and clear, and there must not be any ambiguity.

As compared to other types of documents, the basic information-related distinction of NTD is that they are logically interrelated, and this is achieved by providing appropriate references.

It should be noted that the contents of the text of the standard, including distribution of information in it, are prepared with consideration of a number of formal rules, because of which a high degree of formalization of information is obtained. These rules are spelled out in GOST 1.5-85.

Development of SAPR-NTD requires further development and refinement (in the direction of more rigid requirements as to form and consistent provision of above-listed properties) of NTD. The properties and distinctions of the NTD block as a system of individual interrelated parameters of standardization combined in the NTD with consideration of tags formulated in preceding sections also conform to the basic guidelines of SAPR, namely, systemic unity, development, compatibility and standardization. SAPR-NTD complexes that have been developed or acquired must conform to the requirements that ensue from general systems-related guidelines.

The composition of the data base is determined with consideration of the tasks for SAPR, and it must include characteristics of NTD that are in effect with reference to a given object, applicability with consideration of development of future items, and data pertaining to inventions and patents, positive results of NIOKR [scientific research and experimental design work]. There must also be provisions for control of the composition of the data base so that it would represent a constant optimum and prevent unjustified growth of the list of homogeneous objects of standardization, and implement replacement and exclusion, or limited use of outdated, obsolete elements in the new design, when some new technical developments are included in the data base.

Automated design of NTD provides for drastic increase in quality of the NTD block for homogeneous groups of products as a result of the following requirements that are imposed on ABD:

Duplication of data is excluded if this is not warranted for technical and economic reasons.

There is automation of collection of statistical data concerning the content and use of the data bank in order to organize more effective distribution of memory.

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## FACILITIES AND MANPOWER

### PROBLEMS OF ESTABLISHING INTERBRANCH SCIENTIFIC TECHNICAL COMPLEXES

Moscow PRAVDA in Russian 4 Nov 86 p 2

[Article by A. Tarasov, special correspondent of PRAVDA: "Highway Traffic Jams--Scientists Discuss Problems of Establishment and Development of Interbranch Scientific Technical Complexes"]

[Text] The Academy presidium convened a second time this year to discuss problems of interbranch scientific technical complexes. There are several stands with samples in the second-floor hall. "Biogen" submitted samples of drugs, pesticides, feed supplements that have withstood the fight against the virus of appetizing tomatoes. "Thermosynthesis" exhibited parts made of metal, powder and ceramic, electrodes that acquired superstrength in apparatus for self-spreading high-temperature synthesis or, as they also say, with use of SVS technology.

The question immediately arises: is this the result of cardinal changes in scientific and technological progress or the product of experiments that were conducted in scientific laboratories before establishment of MNTK [interbranch scientific technical complexes]? In other words, did they produce the expected impetus toward mass-scale "embodiment" of the best ideas?

The question may seem premature. Not even a year has passed since the decree of the CPSU Central Committee and USSR Council of Ministers concerning establishment of complexes appeared. Three months ago, a model statute was approved for MNTK. Can one blend into a single entity in this time enterprises, design offices and institutes that are independent and self-contained, have different plans and tasks, into an entity with a unified scientific production process from "idea to series production"? Or should one continue to consider the plans, proposals and meeting of participants as their main "products"?

This is how things really are. But still, they do not hinder many to manifest particular vigor, particular purposefulness and organization to achieve a perceptible result.

K. Zamarayev, corresponding member of the USSR Academy of Sciences and general director of the Catalyst MNTK demonstrated to the audience a ceramic item, of simple appearance, that helps in complete combustion of fuel, which is

extremely important to environmental protection. He explained that the Institute of Catalysis, Siberian Department of the USSR Academy of Sciences, which is the chief MNTK organization, has tried to introduce this product for 10 years to industry, trying to prevail upon enterprises under various agencies. The answer had been always the same: impossible. After establishment of MNTK, only 5 months were required to put this item out of a plant shop. Ten years and five months! I would like to believe that this proportion reflects the extent of acceleration promised by MNTK for scientific and technological progress.

Let me stress the difference between the past and the future. Previously, many leading developments, some even overtaking the worldwide level, were conceived by themselves in scientific laboratories, while industrial production proceeded along its own route. Communication between them was similar to communication between earth dwellers and inhabitants of other planets. At the present time scientific ideas are acquiring tangible force and a planned basis. For example, the "State Plan for Economic and Social Development of the USSR for 1986-1990" contained 71 assignments for the Catalyst MNTK. Introduction of new and effective items will help develop basically new catalytic processes that would help make significant savings in power resources and lower the cost of chemical products.

The Five-Year Plan also included 18 assignments for sectors of industry dealing with Thermosynthesis MNTK developments. Development of SVS technology for the manufacture of heat-resistant, infusible, wear-resistant and other materials and items should vitally interest many sectors.

The Scientific Instruments MNTK includes the Scientific Technical Association of the USSR Academy of Sciences, several plants, design offices and institutes of Minpribor [Ministry of Instrument Making]. There, a cycle has already been started up for series production, starting with scientific research and ending with series production of instruments. The USSR Academy of Sciences and USSR Minpribor have endorsed a program for operation of the complex, which includes output of products in 1990 worth 300 million rubles.

Still, more reserved, if not unsatisfactory, opinions are in the majority. Things are going well in scientific organizations where there are indeed long-standing and stable ties with industry. After all, we do have clear heads on both sides of the bureaucratic barriers, and they find ways to play a business-like duet rather than hold a bureaucratic duel.

However, most problems, as before, encounter barriers, hold-ups, jams--call them what you will--of interagency red tape. Instead of resolving a problem quickly, through direct communication, co-executors are compelled to travel through a maze of ministerial and central board coordinations, confirmations, permissions, etc. It is much too easy for someone who does not want to or does not know how to take care of business to hide behind all this.

There was great alarm expressed when discussing matters at the Svetovod [light guide] MNTK. It may be that one should not reproach scientists for the absence of progressive developments, but attempts to determine when exactly their series production will start and, accordingly the nation's communication system will change to an entirely new footing have led thus far to the unknown. A. Sokolov, doctor of engineering sciences, in his report on the state of the

matter, mentioned the largest Soviet institutes, such as the IRE [Institute of Radio Engineering and Electronics] of the USSR Academy of Sciences, FTI [Physico-technical Institute] of the USSR Academy of Sciences, laboratories and design offices that were assigned to perform basic research, development of domestic technology for series production of fiberoptical light guides and cables, transmitters, devices for gathering and processing information. Prototypes of light guides with increased cold-resistance, strength and reliability, as well as faster transmission of information, appeared on the laboratory tables. But it is still not possible to manufacture these achievements in series.

Why should this surprise us, when there are eight collaborating organizations of MNTK that are subordinated to seven ministries. As yet, these seven nursemaids have not allocated an experimental production base in order to finalize the developments. But even if it appeared, the plans call for technological outfitting of MNTK only in 1990.

I hear a nervous question voiced by the Gosplan representative:

"You said that the equipment will be available in 1990. What are we supposed to do until 1990? Make purchases?"

Even so, the orientation of industry toward imported equipment has delayed drastically development of this sector in our country. Scientists complain that they propose their developments, but their voices are weak. Even a funny question arises: Who, what "level" should be addressed in the Council of Ministers for these voices to be heard and proposals examined? And again: the equipment is distributed "in parts" among several ministries. It happens that a single instrument, not a lathe, is "split" among agencies.

Such fragmentation of a common end task makes a sad impression. Equally sad is the fear of competent specialists that, when our series production reaches at such a rate the present worldwide level, this level will have had time to run ahead by many more years.

Academics G. Devyatikh and A. Prokhorov, administrators at the institutes of chemistry and general physics of the USSR Academy of Sciences, discuss their advances in the manufacture of high-grade optic fiber and their intention to carry this program out to industrial technology. But these institutes are not part of the Svetovod MNTK, and the question arises as to the ultimate target of the manufacturer. What is better, competition, duplication or concentration of forces in MNTK?

Thus, the first attempts to combine "company" and sore branch elements create more concern for the time being than comfort. Academician Yu. Ovchinnikov, general director of the Biogen MNTK, discusses the concerns of "small" chemistry. The annual need for modern drugs, such as interferon or insulin, is measurable in only dozens of kilograms, rather than tons. Small, but diversified plants are needed for gene engineering and fine organic synthesis, but the Minkhimmash [Ministry of Chemical Machinery], which puts out its enormous reactors and units, does not want to handle them.

A voice is heard: these are not even plants, but installations where all of the equipment is made of glass. Minkhimmash will not make it, a solution has to be sought....

Can it be that success in this matter will depend on whether or not Minkhimash will take on glass retorts? Ovchinnikov replies that things are not so simple at bioorganic plants related to gene engineering. First the glassware, then a complicated system of protection, triple control, computers. There are matters over which we and the Minkhimash will have to rack our brains, provided, it is true if the latter will not hold on so obliviously only to the enormous containers that provide so many cubic meters and tons for its plans.

A. Merzhanov, doctor of physicomathematical sciences, from the Institute of Chemical Physics of the USSR Academy of Sciences, who is the scientific administrator of Thermosynthesis, spoke on behalf of the latter. In spite of the fact that there are already 70 concrete developments for introduction using SVS technology, in spite of the fact that a single introduction in this area is capable of yielding 150 million rubles of savings, it is still also difficult to discuss MNTK as a fact. The complex still has no general director. Furthermore, the chief organization is not the institute itself, but its macrokinetics department, which has to legal rights. For this reason, implementation of work together with industry is effected by the staff so to speak on a voluntary [public service] basis, concurrently with their basic scientific work. Yet the MNTK was not conceived as an independent organization, but as a state one. The question of establishing an institute of SVS technology was again raised at the session of the presidium, but only time will show how realistic this is. It would be good if this happened very soon.

In its decree, the presidium of the USSR Academy of Sciences commented on the difficulties related to the attitude of ministries whose organizations and enterprises are contained in the MNTK of the USSR Academy of Sciences toward formation of complexes, as well as the fact that the academy itself has not yet displayed a responsible enough attitude, persistence in solving practical problems. In particular, there is delay in preparing five-year and annual plans for MNTK work, which must be completed speedily.

A commission was formed, consisting of MNTK administrators and representatives of academy offices, to prepare proposals for overcoming organizational difficulties, improvement of material and technical support, construction and other issues related to improvement of MNTK performance.

Yet, the conclusion is begged that there are already more than enough proposals that are basic and tempting, as well as grand. But even if considerable time will continue to be required in the future to implement each of them, and if institutes and ministries will not be able to agree with one another and arrive at a unified decision without external intervention, all suggestions will be useless.

Thus, there is a struggle between energy and inertia on our main scientific technical highway. Let us hope that energy will gain strength in this struggle.

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## TRAINING AND EDUCATION

### TRAINING IN PATENT AFFAIRS STRESSED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 16, 19 Aug-1 Sep 86 p 3

[Article by M. Temchina and reply by G.D. Malushkov, Rector of the Central Patent Science Institute of the State Committee for Inventions and Discoveries: "Un-necessary Contrast"]

[Text] Articles dealing with the problems of setting up and organizing the work of patent services and being able to make competent use of patent information in the development of new equipment were published in issue No. 3 (1986) of the bulletin under the overall heading "Patents Are the Compass of Progress." But this is just one aspect of the matter. A second aspect is equally important: the knowledgeability of the developers of the new equipment in patent matters will also determine whether the machinery created by them is competitive and whether we can secure our nation's prestige in good time.

It is still a strange situation. Each year we spend more than 7 billion man-hours on the development of new machinery, mechanisms, materials and technologies. Furthermore, these are hours of highly intellectual work. Each year, commissions of experts review around 200,000 applications for inventions and... reject approximately half of them.

One of the main reasons is well known. There are still few good patent services at the enterprises and in the organizations. I underscore "good" ones--that is, services completely staffed with highly skilled specialists. Unfortunately, we sometimes have a situation in which a service is set up and there would appear to be enough specialists but there continues to be no fundamental innovation in the new developments.

Take, as an example, just the All-Union Order of the Labor Red Banner Scientific Research Institute of Agricultural Machine Building imeni V.B. Goryachkin (VISKhOM), which, incidentally, is the head institute in the branch. One of the regular inspections periodically conducted by the State Committee for Inventions and Discoveries showed that on average, experts with the VNIIGPE [All-Union Scientific Research Institute of State Patent Examination] reject more than half of the patent applications submitted each year by the VISKhOM workers. What is more, the institute has not sold a single license in the past few years. This is also an indicator of the level of the equipment being developed there.

Why has such a situation developed? Is there no patent section? There is, and not a small one at that. It has a staff of 12. They do patent studies only at the initial stage of a project, however, believing that this is entirely adequate. At the same time, most of the scientific workers, engineers and designers do not have the necessary specialized knowledge. Only 2 percent of them are familiar with patent affairs. And the VISKhOM is not alone in this respect.

But let us not concentrate just on examples like this. Let us turn to a contrasting situation. The All-Union Scientific Research Planning and Design and Technological Institute of Electrothermal Equipment (VNIETO) is also the leading institute in the branch. Unlike the VISKhOM, however, 90 percent of the applications there are accepted as inventions. Industry applies around 150 new developments from the institute each year (the figure is no more than 20 for VISKhOM). We can see that the contrast is very great. Why do the figures for these two institutes differ so?

A special system was set up in the VNIETO back in the '70s, as a result of which inventions were turned from a spontaneous process into a controlled one. The developers were even then assigned the task of developing new equipment only at the level of inventions. And they have coped with it splendidly, hitting the target almost 100 percent of the time over a period of many years.

The institute's success is perfectly natural. It has a strong patent department, it goes without saying, in which 27 people work. They understand very well, however, that no matter how strong the workers are professionally, a great deal still depends upon the competence of the developer himself. It is important that the developer and the patent specialist understand each other almost without words, that they speak a language understood by both. The institute therefore devotes a great deal of attention to the patenting knowledgeability of the engineers, designers and technologists, and around 20 percent of the developers of the new equipment have a special education in patenting. They have all completed either the Higher Patent School or the Central Institute for the Advance Training of Leading Workers and Specialists of the National Economy in the Field of Patent Work (TsIPK).

The institute leaders and the patent specialists feel that this is no longer enough, however. Everyone who works on the development of new equipment needs a knowledge of patenting. The developer today cannot get along without it. The patent department workers therefore decided to set up training at the institute, with a program conforming as closely as possible to the TsIPK program. In time, the lectures became so popular they reached beyond the boundaries of the institute. Today, one sees many developers of new equipment from other scientific research institutes, design offices and branch enterprises in the classes on inventions and patenting and licensing work. Patent specialists explain in detail how to properly make up an application for an invention and how to make a patent search, explain the patenting procedure abroad and the fundamentals of the licensing trade.

While the VISKhOM is not alone, as we have already said, unfortunately, there are also not so many institutes like the VNIETO. It is obviously time to think about some sort of universal patent training for all those who develop new equipment.

From the Editor

In M. Temchina's report, she expresses the idea of universal training in patent affairs. How feasible is this within the framework of the current system for training patent specialists? What are the difficulties? Are any new forms of training being proposed? We have asked G.D. Malushkov, Rector of the TsIPK [Central Institute for the Advanced Training of Leading Workers and Specialists of the National Economy in the Field of Patent Work] of the State Committee for Inventions and Discoveries, to answer these questions.

It should be stated that the idea of universal training in patent affairs actually arose before today. The developers of new equipment do indeed need to possess a certain amount of knowledge about patents, have an idea of the procedure for defending inventions and of the elements of patenting and licensing work, and know the inventor's rights.

The institute prepares patent specialists--that is, people with a specific specialty. Many developers of new equipment are studying at the TsIPK today, although there are certain difficulties involved. The course of full-time training is designed for a 6-month period.

Study by correspondence would most likely be the most suitable for the developers. And we have that. The course is designed for a 2-year period. There are problems also with this, however. Those studying by correspondence meet with the TsIPK instructors only 10 days out of the year, and they do not have the opportunity to hear lectures or to clear up special questions. The dropout rate for those studying by correspondence is therefore great. We accept 2,500 students each year but graduate 1,000 fewer than that.

What do we consider to be the way out of the situation? Improvement of the training and getting the most effective possible use of local cadres of instructors. We now have three training and consultation centers: in Leningrad, Kharkov and Novosibirsk. Two of them, the Leningrad and Kharkov centers, are being turned into branches of the TsIPK. At the branches it will be possible to provide both daytime and night school, which is far more effective than study by correspondence. We hope that the dropout rate will be significantly reduced.

With respect to the VNIIE TO and to training in groups and seminars at enterprises in general, they are even now becoming increasingly widespread. This is due precisely to the fact that the developers of new equipment have already felt the need for a knowledge of patents. These forms of training are worthwhile, of course, but a very serious approach needs to be taken to their organization. The instructors who will be conducting the seminars must not only have the proper, documented education, but must also maintain constant contact with the State Committee for Inventions and Discoveries. Otherwise, the classes could be harmful instead of beneficial.

In my opinion, however, the most promising and reliable way to implement the idea of universal training in patent affairs lies with the higher school. Each graduating specialist should have a certain amount of knowledge about patents when he

leaves the VUZ. The VUZs already have a course on patents, to be sure, but it is optional. We are trying to have it made a required subject, but we have not yet succeeded. The Moscow Institute of Railroad Transportation Engineers, with which the TsIPK maintains close contacts, has some good experience in this work, however. The MIIT has worked out and is implementing a 450-hour program (this is approximately half the program provided at the TsIPK), which is designed for a 3-year period. The course on patents therefore does not overload the general program. One of the results: after a year of training, eight students out of a hundred submitted applications for inventions and received positive decisions.

Recorded by G. Sidorova

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## AUTOMATION AND INFORMATION POLICY

### STATE RESEARCH AND DEVELOPMENT REGISTRY DESCRIBED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 17, 2-15 Sep 86 p 3

[Article by Yu.Ye. Berezin, department head at the Scientific and Technical Information Center of the State Committee for Science and Technology: "The All-Union Scientific and Technical Information Center and the State Registry of Research and Development"]

[Text] The All-Union Scientific and Technical Information Center (VNTITSentr) of the State Committee for Science and Technology is located on Smolnaya, Building 14, in Moscow. For 2 decades now the procedure of state registration of all research and development work (NIOKR) conducted in the nation has been implemented there in accordance with the decree passed by the USSR Council of Ministers, "On the Common State System of Scientific and Technical Information."

Yu.Ye. Berezin, department head at the VNTITSentr of the State Committee for Science and Technology tells about the State Research and Development Registry and about problems of its development and use of the results obtained.

The State Research and Development Registry is expected primarily to assure that the VNTITSentr receives complete report data on research development in a timely manner. This is how it is done: after the project list has been approved, each organization sends a registration card (RK) to the VNTITSentr, which provides a basic description of all the research and development: designation, estimated cost, source of financing and completion schedules. The card also indicates the reason for the work, those responsible for performing it, and the anticipated results. During the entire period of the research and development, the registration card is in the "in-process" file. After the work is completed, the organization performing the work submits a report to us. It is accompanied by a so-called information card, which lists the actual outlays for the work and the results obtained. The report and the accompanying information card are given an inventory number, which is entered on the "in-process" card. The project is then placed into the completed category. You can see that the state registration procedure is outwardly a simple one. Reality necessitates adjustments, however,

since numerous changes occur in the time periods, cost, the designation of the subject, those carrying out the work, and so forth, in the process of performing the scientific research or experimental development work. The keeping of the State Research and Development Registry consists in recording these changes and monitoring the timeliness with which the report data are provided.

The State Research and Development Registry as a physical entity is thus a systematized file of report data on all the research and development conducted in the nation.

How can these data be of use to us? First of all, they have recently been used more and more frequently by directive agencies for making decisions with respect to managing the development of science and technology in the branches, in the regions and in the nation as a whole. The State Registry data can serve as the practical basis for making management models, compiling forecasts of scientific and technical development, and making decisions on individual aspects of the functioning not just of organizations but of entire branches. They also help with the preliminary assessment of the effectiveness of investments in a specific development project even before it is completed.

We feel that complete and timely information on the number and the competence level of organizations of the various branches taking part in the fulfillment of state scientific and technical programs can help to make well-based decisions on the establishment of temporary scientific and technical associations.

Naturally, the above certainly does not exhaust the possibilities for the use of State Registry report data for management needs. Many of them, those which lie "on the surface," so to speak, are still not being realized. It would seem extremely important, for example, to analyze those research and development projects which have culminated with their application, to reveal their proportion in the total amount of research and development and their distribution by branches and regions, and to work out corresponding recommendations.

The State Registry data also show that we have by no means eliminated the small, limited research projects. There are organizations in which more than half of all the planned research and development consists of projects with an estimated cost of less than 10,000 rubles. Projects frequently "cost" between 500 and 700 rubles. Some research which is by no means basic research "drags on" for 7 to 12 years.

In our view, we have long had the need to begin evaluating the scientific level of research and development projects which are concluded with reports consisting of several pages. For example, the Vitebsk Veterinary Institute sent the VNTIIsentr a 4-page report: the first, the title page; the second, a list of those performing the work and a half-page of introduction; the third presented the results of the research; and the fourth contained a list of the literature used. This was the "close" of a project conducted from 1981 to 1985. A report similar in structure, this one consisting of 6 pages, however, was received from the Tula Combine Plant association on work conducted over a period of 2 years.

We need to analyze and assess cases of terminating or removing from the plan research and development which has been conducted for several years and resulted in

nothing. The total cost of these projects for a five-year period frequently amounts to millions of rubles in some organizations. Such "research centers" exist in the Ministry of the Chemical Industry, the Ministry of Instrument Making, Automation Equipment and Control Systems, the Ministry of the Electrical Equipment Industry and a number of other ministries. It is time to have resolute and personal accountability for this kind of "assimilation" of state funds.

11499

CSO: 1814/29

## PATENTS AND INVENTIONS

### LUBRICANT-TESTING INNOVATION QUERIED

Moscow NTR: PROBLEMY I RESHENIY in Russian No 14, 22 Jul - 4 Aug 86 p 5

[Article by M. Treyger, chief of the Central Chemmotological Laboratory of the Zvezda Production Association, candidate in technical sciences: "Who Needs the Order?"]

[Text] "NTR: Problems and Solutions" on the subject-page, "A Social Order," under the rubric "A Technical Assignment," published an article by Ye. Minin, "The Instrument That Isn't There".

They then published a report from specialists of the Kaliningrad School of Higher Engineering on certain results of testing the first of the analyzers of the new complex evaluating the efficiency of the lubricants. The authors of the report suggest joining the forces of the interrelated sectors to switch the discussion on "the instrument that isn't there" to the sphere of introducing an instrument that already is there. We shall not take it upon ourselves to evaluate the degree of substantiation for such a petition.

The most interesting aspect of this situation, however, is the fact that this is already the second year that the Central Chemmotological Laboratory of the Zvezda Production Association (Leningrad) has been operating quite a handy portable instrument which reliably evaluates the efficiency of the lubricant in the circulating systems of ship diesels and motor vehicle engines. The operating principle of the instrument is based on evaluating the physical stability of the spent oil as an oil dispersion system (NDS). The test sample was developed by specialists from the Leningrad Institute of Aviation Instrument Making, in conjunction with colleagues from the Zvezda Association.

Control testing of the instrument under laboratory conditions shows that, with appropriate adjustment, it can be installed in the circulating system of any engine and issue a signal to the automation panel when the lubricant is becoming inefficient and needs to be changed.

It would seem that the social order has been carried out...but this cannot be confirmed either. Who knows which variants are springing up and from whom for the purpose of creating the "instrument that isn't there." At the same time, if the variants do come into being, a deeply interested authority is still

necessary. All the "claimants and authors" for it must be rounded up, and a competition held, with defense of the ideas, schemes and results. The outcome should determine the direction in which the attention of specialists should really be concentrated, after departmental disunity has been surmounted. For this, though, there must be "the most interested authority." And there isn't one....

Therefore, the social order of the bulletin, "NTR: Problems and Solutions", is also essentially left hanging in mid-air. As a matter of fact, who in this country needs 7 million rubles to save one percent of lubricating oil, about which the authors of the foregoing publication write?

The state? Of course. But someone specifically? He is so far unknown....

So perhaps there is some sense in proclaiming a social order to search for an authority economically interested in conserving petroleum products? For in any sector without organizational-economic levers the mechanism of updating equipment and technology will not start up.

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## INDUSTRIAL AND COMMERCIAL APPLICATION

### CRITIQUE ON DELAYS IN IMPLEMENTATION OF INNOVATIVE DEVELOPMENTS

Moscow IZVESTIYA in Russian 16 Oct 86 p 3

[Article by P. Osminin: "Story From an Old Cabinet--Introduction is a Key Issue"]

[Text] "When I put the first folder in it," my interlocutor said pointing to an old filing cabinet, "it was new and empty. The folder was marked with the words, '1963. High-frequency industrial ozonizer.' I was 34 years old then. You can imagine how happy I was that my invention promised unusual benefits to mankind. After all, there is virtually no sector of industry that does not need ozone."

"When I began to work I realized that the output of the ozonizer depends on the frequency of electric discharges. I succeeded in raising the working frequency 100-200-fold. To this day, if compared to the worldwide level, my ozonizer is still 100 times stronger, 10-15 times cheaper and 20-30 times more compact. Could I have imagined then that this entire 'dear cabinet' would not be filled in future years with subsequent inventions, but a 23-year correspondence on the subject of introducing my 'firstborn.'"

My conversation with Yuriy Mikhaylovich Yemelyanov, senior scientific associate in the chemistry department of Moscow State University, was a long one. Hour after hour, thumbing through folder after folder, we came closer to 1986, tracing the painful route of introduction of the invention. A route that has not been terminated to this day.

At first, the blueprints for the ozonizer gathered dust on the shelves of designers at the Kurgan Plant of Chemical Machine Building; then, in 1969, they were forwarded to the Dzerzhinsk affiliate of NIIkhimmash [All-Union Scientific Research and Design Institute of Chemical Machinery]. Its plans were most decisive at first. As they say, "let's give ozone to the nation." It remained only to think about how to best manufacture this unique device. Having received almost half a million rubles from the USSR GKNT [State Committee for Science and Technology], this affiliate promised to produce within 3 years a high-frequency ozonizer with 8-10 kg ozone output per hour to start with.

But the more the workers of the NIIkhimmash affiliate familiarized themselves with the project, the sadder they felt about not having discovered it. They were not able to foist themselves as co-authors of the idea. So then they became busy with their own invention work, which never did succeed.

The years went by. After reminders that a high-frequency ozonizer is in the plans of the institute, the NIIkhimmash affiliate had to come back to Yemelyanov's invention. By the end of 1976, a high-frequency ozonizer was manufactured out of metal. Then it began to wait for its inside surface to be coated with enamel. It never was. For a year there was correspondence on this matter between the manufacturer and the experimental plant in Poltava, the Poltavemalkhimmash PO [Production Association of Poltava for Enameling Chemical Machinery]. And a year later, when Yemelyanov arrived in Dzerzhinsk and saw the conditions under which the ozonizer elements were being stored he realized that there was no longer any sense to cover them with enamel. The precision features had been impaired and the ozonizer would not work. Everything had to be started again from the beginning. But his colleagues in Dzerzhinsk decided otherwise: "Why go back, we must go forward." And when the interagency commission convened, it was announced that work is proceeding at full steam and the institute can manage without Yemelyanov. Then, things did indeed proceed at "full speed." The affiliate submitted its application for the invention. It found a customer, manufactured the ozonizer. True, it did not weigh 300 kg, like Yemelyanov's version, rather it weighed almost 2 tons (stainless steel!) and, moreover, did not work.

"To comprehend the gulf that now lies between the need for ozone and capacities of industry," states Yuriy Mikhaylovich, "just look at these two documents. Here is the request of the Leningrad Vodokanal [water canal] Administration, which needs an installation with total output of 3.5 tons ozone per hour. And this is the reply from the Dzerzhinsk affiliate of NIIkhimmash (presently called LenNIIkhimmash), in which it promises to manufacture by 1990 an installation that will put out 12.5 kg ozone per hour."

"Of course, more powerful ozonizers could be purchased abroad," Yemelyanov continues, "but even there they do not have a high output, require much metal in their production and fetch a fabulous price."

I thought to myself, could not the scientists of Dzerzhinsk realize this, is it possible that the Ministry of Chemical Machinery is not interested in the manufacture of basically new equipment, and is it alone in this situation? After all, ozone is used in the petroleum, pharmaceutical and textile industries, in metallurgy and many other sectors, and everywhere it can render production immeasurably more effective.

But let us continue the sad journey through the files in the old cabinet. In 1971, the USSR Ministry of the Aviation Industry, which became interested in Yemelyanov's engineering idea, decided to manufacture a small, single-element ozonizer. It produced 400 g ozone per hour. For Yemelyanov this was a victory. The operating principle of the "little device" proved itself entirely. Now one should have gone on to more powerful installations. But it is only in 1980 that such work was assigned to one of the institutes in this sector.

Yemelyanov removed some yellowed blueprints from the cabinet and began to work on production of the unique unit together with institute workers. In 1981, two seven-element high-frequency ozonizers took up their work places.

It was almost the end of 1984, and the strongest 10-ton installations of the Kurgan Plant were still producing 6 kg ozone per hour each. Yet the needs of the nation's industry continued to grow. According to incomplete estimates for the 12th Five-Year Plan, they constitute 55 tons ozone per hour only for technological processes and treatment of liquid sewage. If, however, we take into consideration treatment of smoke gases from heat and electric power plants, which are the main polluters of the atmosphere, this figure must be at least doubled.

Industry is waiting for high-power ozonizers. Introduction of a number of new technological processes is being delayed, untreated waste is being dumped into rivers from coal-tar chemical and hydrolysis plants, and "foxtails" are still extending from the chimneys of most chemical enterprises.

In 1984, the USSR Gosplan, aware of the achievements of the Ministry of the Aviation Industry in development of high-frequency ozonizers, included the assignment, "Ozonizer, tubular, high-frequency. Developer--MGU [Moscow State University], manufacturer--Ministry of the Aviation Industry, Quantity--2."

I thought to myself, "Looks like that's all now. This means that by the end of 1985 the Minaviaprom [Ministry of the Aviation Industry] manufactured 2 units and handed them over to Minkhimmash [Ministry of Chemical Machinery] for speedy introduction into production," until Yemelyanov opened up yet another swollen file, in which there were documents dated 1985: on 29 July, V. Chuyko, deputy minister of Minaviaprom wrote to the USSR Gosplan that there were no specifications for the high-frequency ozonizers nor any special advances. Next was another letter, dated 27 September. Another deputy minister of the aviation industry, A. Bratukhin, informed the Minkhimmash that there are specifications for the ozonizers and the ministry is prepared to hand them over. Another letter from the same ministry contained a request to eliminate development of the high-frequency ozonizer from the plan for scientific and technological progress.

There were many letters, with a diversity of arguments. But 1985 was coming to an end. What then did the Minaviaprom report to the USSR TsSU [Central Statistical Administration] concerning fulfillment of the assignment in the State Plan? The answer was unequivocal, the assignment had been fulfilled. Modified old prototypes were submitted to the interagency commission that finally convened in April 1986 to test prototypes of high-frequency seven-element ozonizers. After being "improved," their output ... dropped to 5% of the nominal figure, and for this reason the commission did not deem it possible to recommend the installations for broad introduction.

"At the present time, GKNT established another interagency commission to work out recommendations on development of the manufacture of ozonizers," Yuriy Mikhaylovich said to end his sad story. "This commission must decide who, finally, will manufacture high-frequency ozonizers. It would have been logical for the Minkhimmash to do this work, since both the Scientific Research Institute and plant specially founded for this purpose are under its jurisdiction. But, some experience has been gained at the Ministry of the Aviation Industry, loss of which would delay introduction for several years. I do not know what the commission will decide; I only know one thing, the early 1990's (when the patents expire)



is not so far away, and we are losing an opportunity to be the first, the "fashion-setters," as they say, in ozonizer building."

As I was leaving the inventor, I glanced for the last time at his "dear cabinet." Virtually all of the shelves were filled with thick files, and only on the top shelf, on the side, did a small space remain. I very much wished for this space to be taken up by a small newspaper announcement: "The first series of high-frequency ozonizer installations was delivered to the nation's enterprises." But for this to happen, new decisions must be validated and their executors' attitude must be based on the interests of the national economy, rather than bureaucratic.

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## BRIEFS

**PYRITE TREATMENT TECHNOLOGY**--A new technology for working pyrites, a by-product of ore dressing plants, has been introduced at the Dzhezkazgan Mining and Metallurgical Combine. Previously, millions of tons of pyrites accumulated at dumps, since known methods of separating the valuable components from them required large outlays of energy. The scientists discovered that the sulfides contained in the raw material will oxidize, giving off a large amount of heat, and proposed using ordinary oxygen-blast converters for the processing. This has made it possible to increase the output of nonferrous metals and sulphuric acid while using considerably less electric energy. [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 2] 11499

**AUTOMATION SHORTENS PRODUCTION CYCLE**--The unified "memory field" of the integrated production complex set up in cooperation with scientists of the Information and Automation Institute of the USSR Academy of Sciences at the Zavod imeni M.I. Kalinin Association in Leningrad has made it possible to eliminate the "language barriers" between various stages of the "design to product" cycle. Upon receiving an assignment, the engineer turns to the "electronic library" and selects the most acceptable alternative. The machine then issues the necessary blueprints and automatically translates them into the language of the control machines for the programs, which assign the metal-working mode and select the tools. All of this has made it possible to reduce the time required to reset the equipment almost 10-fold. [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 2] 11499

**PETROMETALS EXTRACTION**--We still have to speak of this area of the national economy in the future tense. Workers at the All-Union Oil Geological Prospecting Institute are already thinking about the raw materials base, however. The Lenin-graders have begun inventorying deposits of liquid hydrocarbons containing metals. In many cases their extraction promises to be more economical than the extraction of metals from ore. [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 2] 11499

CSO: 1814/29

## INTERNATIONAL S&T RELATIONS

### U.S. SCIENTIFIC CENTERS DESCRIBED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 7

[Article by N. Dvoretz under the rubric "Assessment of Trends": "Jack-Of-All-Trades: Diversified Scientific Centers of the USA (Characteristic Features of Their Work)"]

[Text] Over the past few years the author of this article, a specialist in international economic affairs and currently chief specialist with the USSR Gosplan, has studied the way the work is organized at scientific centers of the USA, whose operations he has learned about on the site during official trips. The purpose of these scientific and technical complexes is essentially one of accelerating the application of innovations. A trend of establishing such organizational and management structures can be seen also in world practices. The interbranch scientific and technical complexes (MNTK) are designed to accomplish these tasks in our nation. In our opinion, a description of the specific features of the functioning of scientific and technical complexes in the USA is therefore of particular interest.

It would obviously be best to begin the description of the functioning of the "diversified scientific centers" (DSC), or, as they are also called, "multi-discipline complexes," with a specific description of one of them, the Stanford Research Institute (SRI), as an example.

The main complex of laboratories and shops of the SRI occupy an area of 28 hectares among the verdant blocks of the fashionable town of Menlo Park, approximately 50 kilometers south of San Francisco. Located within an hour's drive of the SRI are located the headquarters of a number of the largest corporations and banks, two world-class universities--one at Berkeley, and Stanford in the city of Palo Alto--as well as "America's technological bonanza," so-called Silicon Valley, where a thousand companies produce up to 25 percent of the USA's science-intensive products (electronic computers, microprocessors, lasers, robots, aerospace equipment, telecommunication systems and similar products totaling 40 billion American dollars annually. (Footnote 1) (The official name of the valley is Santa Clara, and the city of San Jose is its administrative center)

In addition to its main complex in Menlo Park, the SRI has regional affiliates and representatives in New York, Chicago, Honolulu, London, Zurich, Frankfurt am Main, Tokyo, Singapore, Riyadh and certain other cities.

Since it was founded in 1946, the SRI has stated its preparedness to work on "any problem which can be solved through research and development and which any individual, business or institution is prepared to finance." Such a declaration smacks to some degree of greediness and self-advertisement. The range of the institute's research and development (NIOKR) today embraces 110 scientific areas, however, from "A" to "Z" in modern science: acoustics, biotechnology, artificial intelligence, compositional materials, lasers, microprocessors, psychology, systems engineering, sociology, pharmaceuticals, chemistry, ecology, economics and nuclear devices. The vast majority of the SRI's projects are of an applied nature, but the institute also performs basic research (18 percent of its total research and development) and provides industrial and management consultation services (12 percent). It is important to note that the SRI undertakes research pertaining to practically any phase of research and development, including expert appraisal, exploratory research, TEO [technical and economic substantiation], OKR [experimental design work], engineering supervision and pre-industrial testing. The end results of the projects can therefore be summaries of analytical information, scientific and technical forecasts and concepts, new methods, technologies and materials, experimental processes or prototypes of devices and engineering systems.

The SRI is not the leader, nor does it have the full research function in each of these areas, by far, of course. Because its regular staff includes highly skilled researchers in dozens of special fields, however, because of its vast facilities, which include powerful computer and informational resources, and finally, because of its unique technology for organizing and conducting the research, the SRI has acquired a stable reputation as a "jack-of-all-trades." The institute's recent successful projects, which are at the stage of introduction, include an ultrasonic endoscope, which was produced by synthesizing a number of technologies and which has a greater discriminating capacity than roentgenoscopy for scanning the internal organs. This invention opens up the way to an entire generation of ultrasonic viewing devices, the potentials of which are only just beginning to become clear. Among other things, possibilities are being studied for using ultrasonic tomography for the early diagnosis of breast cancer and various eye diseases, in orthopedics, and so forth.

We could name dozens of other projects of the institute--it carries out more than 2,000 each year--which bear the mark of the innovative approach, the high caliber of the research and the ability to unite the efforts of scientists in various fields. We would like to stress something else here, however.

Despite its widely proclaimed preparedness to accept any research project, the SRI is highly circumspect when it comes to selecting orders for research. It evaluates the scientific and economic importance, the necessary costs, the degree of risk, direct and potential benefits, conformity to its own scientific and technical policy and to regional and state (gosudarstvennye) interests, the possibility of a conflict with other clients, and a number of other factors.

If a request (or an original proposal) for a research project is acceptable, the institute concludes a contract with the client, which precisely defines the

objectives and time periods for completing the project, gives the specifications for the final product, sets a ceiling on costs and fees for the research, and contains a list, coordinated with the client, of those who are to perform the research. It is important that the end product is always oriented toward maximum satisfaction of the client's needs and provides real economic or functional benefits for the client, thereby justifying outlays for the research and development performed by the institute, even though they may be high.

Profit is not an economic objective of the SRI. However, the proceeds from the research projects not only compensate the institute for outlays in live labor, materials and technical resources, but also assure that all the elements of the research and development process are profitable. Five percent of the institute's income goes into its development fund. Out of this fund are financed, also on a contractual basis, the SRI's own research programs, which are designed to assure that the institute is competitive in the more prospective areas at some point in the future, ordinarily from 3 to 5 years later. The SRI today has 20 programs in such areas as artificial intelligence, microelectronics, genetic engineering and advanced materials.

Each project at the SRI is carried out by a special-purpose group (SPG) set up in response to an established need for institute services and within the time frame and cost limitations specified in the contract. Reference is made to the "individual structure" of the special-purpose group, which conforms to the substance of the subject of the research and ensures its successful accomplishment. It has been an effective procedure to include a qualified representative of the client's organization in the membership of the special-purpose group with the rights of a consultant or a group member. The membership of the special-purpose group ordinarily does not exceed 12-14 specialists, but this may be increased to 300-400 people in individual cases. The period of time for completion of the projects ranges between 4 and 12 months and is ordinarily no more than 6 months.

Those in charge of the special-purpose groups, so-called entrepreneurial scientists or scientific administrative specialists, make up an extremely specific category of workers, the "treasure house," of the SRI. It is through the entrepreneurial scientists that the SRI achieves both the tactical and the strategic aims of its scientific and technical and its economic policy. Their job includes searching for or generating commercially promising ideas for development; finding and negotiating with a client; selecting the members of their special-purpose group, planning and monitoring their work; summarizing the results of the project and submitting them to the client.

The entrepreneurial scientist bears total responsibility for the projects assigned to him in accordance with the terms of the contract. These scientists do not account for more than 8-10 percent of the SRI's research staff, but their internal organizational and external functions are important to the institute.

The SRI is a rare but not unique scientific institution in the USA. A number of other scientific centers operate in a similar manner. These include the Battelle Memorial, Denver, Midwest, Southwest and Southern research institutes, the firms of Arthur D. Little; Booz, Allen and Hamilton; Planning Research, and a number of other organizations. They came into being and developed initially only to meet regional needs for applied research and development. Others, like the SRI, were "offshoots" of large universities but rapidly gained national importance by filling orders for state (gosudarstvennyye) agencies.

Two common features which create the category of the differentiated scientific center predominate over these and other differences. The first is the capacity of the centers to conduct research in a broad range of scientific disciplines with in-depth specialization in a number of key fields and a clearly defined orientation toward interdisciplinary research and work at the junctures of the traditional disciplines. The second feature consists of the centers' performance of research on a contractual basis through the special-purpose groups (temporary teams), and of the special role of those in charge of the groups.

Today, the diversified scientific centers perform the function of a connecting link between theory and praxis, between the producers of information in scientific circles and its consumers in the state realm and in industry. Three facts are particularly important. In the first place, the differentiated scientific centers have become a sort of countercurrent to the intensifying process of differentiation and stratification of the scientific and technical disciplines, become the place where it is possible to take an integrated approach to the study of comprehensive problems increasingly arising for the federal and state (shtatnyye) agencies and large companies in the USA. In the second place, the economic situation in the nation and the need to activate extensive markets for the products of science are forcing the differentiated scientific centers to increasingly focus their efforts on problems of interest to several or many branches of industry. This accounts for the fact that the stress in the centers' strategies is on the development of advanced materials, on the quest for new industrial technologies, on information and communication equipment and technology, the automation of production processes and clerical work, energy conservation and ecological aspects. This approach is essentially the other side of the coin of interdisciplinary research and development. In the third place, thanks to their research approaches and organizational technologies, most of the differentiated scientific centers are able to precisely structure and efficiently resolve problems assigned to them.

A number of scientific-organizational and management factors are manifested in the work of the differentiated scientific centers as a whole, which, in combination, enhance the effectiveness of the research and development. The differentiated scientific centers have demonstrated repeatedly and in many areas their ability to effectively respond to a need for research and development and to substantially shorten the "research-development-production" cycle. The differentiated scientific centers function particularly successfully at the junctures of the scientific disciplines, providing not only for the "flow" of information from one branch to another, which is very important in and of itself, but also scientific and technical breakthroughs--that is, the development of qualitatively new types of equipment, technologies and materials. These centers have become an inseparable and very important part of the network of scientific institutions in the USA, focusing primarily on the accelerated resolution of interbranch problems and the application of innovations.

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CSO: 1814/28

## REGIONAL ISSUES

### DEVELOPMENTS IN YAKUT ASSR DESCRIBED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 pp 1, 7

[Article under the rubric "The Yakutsk Affiliate of the Siberian Department of the Academy of Sciences, USSR": "The Life of the Scientific Center"]

[Excerpts] The Yakutsk Affiliate is an important center of Soviet science in our nation's Siberian North. Established in 1949, it now comprises seven institutes with around 3,000 employees, including one academician, one corresponding member of the USSR Academy of Sciences, 40 doctors and more than 340 candidates of sciences.

1. The first economics institute in the nation's north, the Institute of Economics of Comprehensive Exploitation of the Natural Resources of the North, was established in August of this year as part of the Yakutsk Affiliate (YaA) of the Siberian Department of the USSR Academy of Sciences. The history of the institute's founding goes back to 1947, when the economics section was set up as part of the Yakutsk Center of the USSR Academy of Sciences. Its own economics school was established and dozens of economists were trained during this time, and these comprised the foundation of the new institute. They are currently engaged in projects to work out the theoretical and methodological problems of intensifying production, improving methods of forecasting and planning the economy of the North, and validating the concepts for a comprehensive program of scientific and technical progress and the plan for the distribution of the Yakut ASSR's productive forces. The institute's main areas of scientific work also include the study of the characteristics and patterns of development of the productive forces in the regions populated by ethnic groups of the North, the study of their culture and way of life.

6. The mining industry developing in Yakutia's specific and climatic conditions forms the foundation of its economy. The Mining Institute of the North has been assigned the task of fundamentally transforming mining operations with flow-line technology and mechanized complexes.

One of the first steps in this direction was a flow-line technology for working placers, developed jointly with production workers of the Yakutzoloto Association. Application of the technology in the Aldanzoloto Combine just in stripping operations for the working of placers will make it possible to save up to 1 million rubles.

Frozen rock is perhaps the main difficulty encountered by the mining industry of the North. Many projects of institute scientists to develop a reinforced cutting tool, chemical and physical methods of softening the ground, and so forth, have been devoted to overcoming it.

The laboratory which studies the effect of super-high-frequency radiation on frozen rock has developed the EVIK-1 unit and turned it over to the Yakutenergo Association for use. It is designed for softening frozen rock for the emergency clearing of underground communication lines. Use of the unit has made it possible to reduce the time required to eliminate the effects of accidents from 7-14 days to 6-8 hours. In addition, the basic cost of the operations is cut in half, and the amount of labor required is reduced 15-fold compared with the traditional methods of preparing frozen rock (thawing with fire or steam, and others). The annual saving from the use of the unit in Yakutenergo has amounted to 191,500 rubles. It has performed well under all conditions, and the USSR Ministry of Communications has decided to turn it over for series production.

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## SCIENTIFIC AND TECHNICAL PROGRESS IN MOSCOW DESCRIBED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 3

[Article by Candidate of Economic Sciences A.S. Kolesnikov, department head at the Institute for Economic Problems of the Comprehensive Development of Moscow's Economy: "Scientific and Technical Progress in Moscow: Paths of Reorganization"]

[Text] The restructuring of regional management of scientific and technical progress is one of the important directions for accelerating it. Today, the independence of scientific organizations and enterprises is being enlarged considerably, and their interest in and concern for achieving the best scientific and technical results in the world are increasing. The labor collectives have been oriented in precisely this direction by the decree recently passed by the CPSU Central Committee, the Presidium of the USSR Supreme Soviet and the USSR Council of Ministers, "On Measures to Further Enhance the Role and the Responsibility of the Soviets of People's Deputies for Accelerating Social and Economic Development in Light of Decisions of the 27th CPSU Congress," and the Concept for Moscow's Comprehensive Social and Economic Development to the year 2000, approved by the Politburo of the CPSU Central Committee.

Candidate of Economic Sciences A.S. Kolesnikov, department head at the Institute for Economic Problems of the Comprehensive Development of Moscow's Economy, tells about certain economic problems pertaining to the management of our capital's scientific and technical complex.

During the past five-year period only around 12 percent of the projects of the capital's branch scientific research institutes achieved the world level. This lag was due in great part to the functioning of the system for managing science, which does not measure up to the modern conditions.

The situation is changing today. During the first 8 months of this year, 245 new types of machinery, equipment and instruments were mastered in the capital; the portion of improved items with index "N" increased to 33.9 percent of the

total production volume for consumer goods; 1,800 outmoded items were replaced with new products; and in 1986 the capital's machine-building industry has maintained twice the rate of production growth it had under the 11th Five-Year Plan. The decree recently passed by the CPSU Central Committee, the Presidium of the USSR Supreme Soviet and the USSR Council of Ministers, "On Measures to Further Enhance the Role and the Responsibility of the Soviets of People's Deputies for Accelerating Social and Economic Development in Light of Decisions of the 27th CPSU Congress," has been one of the measures contributing to the accelerated development of Moscow's scientific and technical complex. This decree was an important step in the mobilization of territorial reserves for implementing the strategy of intensive economic development.

It has opened up possibilities for shared participation by interested organizations in the establishment of specialized enterprises which perform the reconstruction and technical reequipping of production facilities located within a given territory.

Cooperation will be expanded, and economic ties will be developed in the production of mechanization and automation equipment for local needs. The practice of joint use of unique equipment and scientific instruments, the experimental base and facilities of the production infrastructure will be increased.

The ispolkoms of kray and oblast and the Moscow and Leningrad city soviets have now been permitted to include assignments for the resolution of local problems in the plans of scientific institutions located on their territories, regardless of departmental subordination.

The Concept for Moscow's Social and Economic Development to the Year 2000 is an important organizing basis for restructuring the territorial management of the capital's scientific and technical complex. This concept, recently approved at a session of the Politburo of the CPSU Central Committee, indicates the priorities in the development of branches and areas of activity which determine rates of scientific-technical and social progress.

As a result of the increased role of the soviets in the development of the economy of their territories, the main assignments of the scientific and technical program for resolving interbranch problems of territorial significance, as well as indicators of the technical level of the production of the most important types of goods and services, will be included in Moscow's municipal plan. A scientific and technical program covering problems pertaining to the development of the Moscow urban economy is presently being worked out under the direction of the State Committee for Science and Technology and the city ispolkom. The attention of the soviets must be directed also toward the resolution of problems occurring in connection with the establishment of and support for the functioning of interbranch scientific and technical complexes (MNTK). This pertains almost exclusively to the capital, since only in Moscow are concentrated as many as 10 head organizations of the newly established MNTKs. Even if there were only one MNTK in the city, however (as there is in Vladimir), questions pertaining to its effective development would be extremely important to the city soviet.

In view of the new tasks and possibilities, the organizational structure for the management of science and scientific and technical progress in the city is in

need of corresponding adjustment. One of the proposed versions of the structure for Moscow includes the MNTKs, around 50 head institutes and a number of public organizations operating within its territory. We believe that it would be logical to include in this system a certain number of small scientific and technical organizations for interbranch, pioneering innovations and for providing industry with services in engineering and the development of know-how. In our view, it would be useful to apply the available experience of engineering centers of the Ukrainian Academy of Sciences and temporary scientific and technical laboratories set up at such Moscow institutions as the Institute of the Science of Machines or the Solid State Physics Institute for creating such organizations with a flexible structure.

It would also be expedient to permit the soviets to involve experimental enterprises located in the city and production capacities of Union subordination in the work on "local subjects." The first could be accomplished in the course of the present expansion of the network of scientific production associations and improvement of their structure. The accomplishment of the second task would call for a more active role by the soviets in planning the production of cultural, personal and household goods. This would undoubtedly have a beneficial effect with respect to the successful resolution of social problems within the given territory.

Unfortunately, the procedure for working out the industrial production of the means of mechanizing and automating production at local enterprises has still not been precisely defined. The needed decisions here are along the line of converting inefficient local enterprises to the production of equipment which helps to improve working conditions and increase the productivity. The fact that the soviets are now permitted to assume control over enterprises producing goods to meet local needs will also contribute to success. Territorial management agencies may also be the client in the construction of facilities for the interbranch production infrastructure. The formation of territorial associations and enterprises on a contractual basis, which submit orders to science for scientific research and development of interbranch significance, is a fundamentally important direction for improving the system of management of scientific and technical progress in the region.

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## INADEQUATE USE OF SCIENTIFIC POTENTIAL OF UZBEK SSSR DISCUSSED

Tashkent PRAVDA VOSTOKA in Russian 12 Nov 86 p 3

[Article: "The Great Duty of Scientists--From the General Assembly of the Uzbek Academy of Sciences"]

[Text] The General Assembly of the Uzbek Academy of Sciences discussed the tasks for scientists in this republic in the light of the decisions of the 3d Plenum of the Uzbek Communist Party Central Committee. Both the speaker, P. K. Khabibullayev, president of the Uzbek Academy of Sciences, and other speakers sharply criticized the many flaws that have gained a firm foothold in the performance of departments of this republic's academy and pointed to the constructive ways of overcoming them.

If we were to glance at the situation in science from the standpoint of a decisive turn toward the needs of the national economy, it must be conceded that the scientific and technical potential of this republic is not put to full use and does not yield the desired effect. The fact of the matter is that, in recent years, extensive factors began to prevail in development of science in this republic. Build-up of the material and technical base, growth in number of scientific institutions, augmentation of their staff and increase in funds allocated for research have not yielded an appropriate return. Under the last five-year plan, the growth in expenses for the Uzbek Academy of Sciences exceeded considerably the growth in return on investments. In some sectors of science we are observing a decline and standstill.

Aware of their great responsibility for the existing situation, scientists mentioned many negative phenomena. We are particularly alarmed by the current state of development of social sciences in this republic, which does not conform to today's needs. The fact of the matter is that reorganization of the work of social scientists is proceeding extremely slowly; it encounters conservative thinking on the part of some representatives of this science, their habit of living and acting the old way, to drag along behind events. We do not have any in-depth developments dealing with the broad set of problems of the scientific and technological revolution, this republic's scientists have not yet become aware of their profound responsibility for socioeconomic development of the republic, they have not concentrated their attention on problems of theory and practice of acceleration, dynamics of social-class and international relations, development of democracy and self-rule, processes of formation of the new man--

a wide range of major and responsible problems on which the party organization of this republic is working. In brief, there has still not been a decisive change in the work of social scientists as required by socioeconomic and spiritual development.

Attention was called at the meeting to the fact that not a single summary work on the latest history of Uzbekistan has been produced at the Institute of History in the last 10 years. The Institute of Archeology is not reporting on the results of the latest digs and discoveries and does little to popularize the advances in archeology. The activities of the Institute of Philosophy and Law are characterized by marking time, digressing from the burning issues of our times and rehashing long and well-known truths. The staff of the Institute of Economics and the council for the study of Productive forces have also not overcome the lag of economic science behind the demands of modern times. They have not produced major works or practical developments that would help reorganize this republic's economy, improve industrial relations and welfare of the people with consideration of regional distinctions and the actual contribution of this republic to a unified national economic complex of the nation. On the whole, the investigations of our economists are characterized by a low theoretical level of work and poor methodological base. There are 16 doctors of sciences and 97 candidates of sciences at work at the Institute of Language and Literature; however, many of their investigations are returned repeatedly by publishers because of their low scientific level. The work of other social sciences departments of the Academy is not brilliant either. And, as a result of this, now that there is a need to analyze the causes of the many negative phenomena in this republic, our social scientists are not prepared to offer concrete recommendations for practical action to eliminate these social anomalies.

Developments and recommendations of researchers are being introduced extremely slowly. Due to deficiencies in the mechanism of communication between science and industry, a considerable part of the developments completed under the last five-year plan have not been introduced into the national economy. The situation concerning training of scientific replacements, "rejuvenation" of scientific personnel prompts deep concern. Protectionism and nepotism, which have taken root in some research institutions result in a situation that people who do not have capacities for scientific creativity sometimes hold the jobs of worthy scientists. Institutes and laboratories are transformed for such sorry scientists into a peaceful backwater, where they can work for years without proper return.

As they disclosed the "mechanism" of such time marking, the speakers indicated very justifiably that this is possible only in collectives where Party organizations and the community have become reconciled with such a situation where grovelling flourishes, there is no broad publicity and strict impartial criticism.

M. Bobokhodzhayev, doctor of historic sciences and secretary of the Party organization at the Institute of Eastern Studies, spoke bitterly about the fact that reorganization has actually not begun at that institute. Its staff, which submerged itself in the study of the manuscript collection, does not investigate current sociopolitical, social and ideological processes in the countries

of the East. Symptomatically, in this respect, one of the recent meetings of the scientific council, discussed the achievements of prior years, instead of exposing serious flaws.

Kh. Tursunov, director of the Institute of Party History under the Central Committee of the Uzbek Communist Party, stated: "We detect a tendency, in the works of social science historians, toward subjective evaluations; the guiding role of the Party and place of the people that created it in the historic process are not properly demonstrated. In several monographs and publications there is no in-depth analysis that would trace the distinctions of each developmental stage, which is extremely necessary in the matter of investigating the knowhow in building of socialism."

It was emphasized at the meeting that this republic's social sciences are presently experiencing a changing stage in their development. Much is happening in this process due to mistakes of the past, previously existing distortions and digression from Party and class positions in a number of historical events and performance of individuals. As noted in the speech of E. Yusupov, vice-president of the Uzbek Academy of Sciences, suffice it to recall the publication of I. Muminov, in which he tried to impart progressiveness to the personality of Timur, shading his bloody and cruel predatory campaigns associated with extermination of entire peoples. It is also instructive that the valid criticism of these grossly fallacious views originated from scientists in Moscow and Leningrad, rather than of this republic. Analogous attempts had also been made in our times in the biased description of Babur. Only his merits as a historian and poet are discussed comprehensively and praised in numerous works. And there is deliberate omission of his actual deeds as a major feudal lord and oppressor of the masses.

A real scientists should not be afraid of historical truth; he should discuss difficulties, problems and oversights truthfully first of all, and should base his investigations on the solid foundation of Marxist methodology.

The lack of business-like scientific criticism led to serious omissions in the publishing activities of the Academy. While there is an enormous number of burning contradictory social problems in this republic, until recently an atmosphere of serenity, complacency, self-praise and mutual forgiveness prevailed among social scientists. As a result, fewer demands were made as to quality of works recommended for publication. The manuscript of the first volume of "Istoriya kultury Uzbekistana" [History of Uzbekistan Culture] was deemed weak in content and requiring radical revision; the manuscripts entitled "Istoriya uzbekskoy sovetskoy literatury" [History of Soviet Uzbek Literature] and "Russkaya rech uzbekov v usloviyakh dvuyazychiya v Uzbekistane" [Russian Speech of Uzbek Nationals in Bilingual Uzbekistan], submitted by the Institute of Language and Literature, are on a low level, and the latter was again rejected even after revision. The work, "Sotsialisticheskoye sorevnovaniye na sele" [Socialist Competitions in Rural Areas], which was unanimously approved by four reviewers, turned out to be utterly unfit for publication. Lack of principle-mindedness and exactingness may explain the publication of weak works with no practical novelty, such as the collective monographs, "Basmachestvo: sotsialno-politicheskaya sushchnost" [Sociopolitical Essence of Counter-revolutionary Robber Bands][in Central Asia During Civil War], "Tashkent v period

razvitogo sotsializma" [Tashkent in the Period of Well-Developed Socialism], "Razvitiye materialno-tekhnicheskoy bazy selskogo khozyaystva Uzbekistana" [Development of Material and Technical Base of Uzbekistan Agriculture], and "Ideologicheskaya borba i sovremennaya uzbekskaya literatura" [The Ideological Struggle, and Contemporary Uzbek Literature]. The meeting demanded that a solid barrier be put in place against publication of works written on the basis of empirical facts, paraphrasing truths that are common knowledge and have no scientific value.

The poor study of historical roots of traditions, customs and rites that exist among the population of this republic is very damaging to ideological and political educational work. Nevertheless, the works of social scientists still do not shed sufficient light on the deleterious influence of vestiges of the past, and progressive rites and traditions are not publicized enough.

As stressed in the speech of R. Kh. Abdullayev, secretary of the Central Committee of the Uzbek Communist Party, the strategic course of the Party outlined by the 27th CPSU Congress is aimed at implementation of persistent and purposeful change to a better organization and effectiveness of the economy. To reach this goal, the Party has elaborated a distinct strategy, which consists of concentrating the existing resources and potential on key directions, while advancing on a broad front of science and technology. The role of science as the chief factor in accelerating socioeconomic progress and of all social development will grow with each passing year. However, if we proceed from the stipulations of the 27th CPSU Congress, there have still not been any radical changes in science in this republic. The presidium of the Academy of Sciences has reduced the reorganization to establishment of 3-4 scientific centers and putting some order in the structure of scientific institutions. Can we achieve effective scientific research without changing our attitude toward the matter, without switching to the track for acceleration? For the last few years, science in our republic gave up its positions. Yet there was a time when we had the active and well-known scientific schools of academicians Sarymsakov, Khamrabayev and Yunusov. Prior glory was convenient for some people. But one cannot rest on one's laurels forever. Where then are the modern schools? There are none.

The main concern today is to open the way to science for talented young people. Each academician and professor must have his own gifted students, his own school that is called upon to provide for further progressive advancement. The life of a scientist and progress in science are continued by his disciples.

Our academy does not have enough mobility. Just take a matter such as development of a new cotton-picking machine. There has never been an Academy meeting at which it was not discussed. But it has not advanced any further than mere words. The machine that is being waited for in the fields does not exist as yet.

Social science institutes should become a reliable support for this republic's Party organization in the area of implementing our ideas and conception of accelerated development in all areas of social life. In this regard, one should review once more the thematic orientation of scientific research, hold contests in scientific departments for new ideas and suggestions, offer every support and encouragement to the work of the most creative teams, gifted scientists,

provide latitude and support everywhere for implementation of bold and creative ideas. There must be elaboration and refinement of criteria for the return from each collective and all scientists; we must see to it that they work with full return. It is rather important to implement prompt certification in order to decisively get rid of scientific deadweight.

Special attention was focused on the moral psychological climate in scientific organizations, the human factor. We must put a decisive end to fruitless chatter, demagoguery, protectionism and grovelling, which have still not been eradicated from many scientific institutions. Party organizations and the broad scientific community are called upon to lead the struggle for a change, an effective reorganization.

Quite a few constructive suggestions were offered in the speeches of academicians I. Khamrabayev, A. Glushchenko, Kh. Usmankhodzhayev and corresponding members A. Glushenkova and A. Askarov, as well as R. Zakhidov, director of the Institute of Power Engineering. Future investigations should be based on the study of data on life in our republic, dialectics of development of socialist society at a new historical stage, sociophilosophical and methodological problems, acceleration of socioeconomic development of Uzbekistan, and all aspects of increasing the role of the human factor in the advancement of society. Life urgently demands creative development of theory of economics and, first of all, such problems in it as dialectics and prospects of development of productive forces and industrial relations, refinement of the structural reorganization of the economy. Scientists must concentrate their main efforts on elaboration of complex regional special-purpose programs with basic and applied relevance. There must be activation of work dealing with established under the Uzbek Academy of Sciences of an interagency scientific technical center under the name of "Labor Resources," with mandatory use of modern computer hardware. Considering the tasks put by the 3d plenum of the Uzbek Communist Party Central Committee, revision and substantial corrections should be made in the work plans of ideological commissions and methodological seminars held in scientific departments.

The decisions of the 3d plenum of the Uzbek Communist Party Central Committee, their realist nature, irreconcilability with regard to flaws, and profound social optimism inspire each scientist to work selflessly, with initiative and optimum return. The General Assembly of the Uzbek Academy of Sciences expressed its confidence in the fact that the body of Uzbek scientists, numbering many thousands of people, will devote all its strength, knowledge and energy to augmenting their contribution to implementation of the plans for socioeconomic development outlined by the 27th CPSU Congress and 21st Congress of the Uzbek Communist Party.

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V. I. Maltsev, responsible official of the CPSU Central Committee, B. F. Satin, first secretary of the Tashkent Party gorkom, and G. Z. Zakhritdinov, deputy chairman of the Uzbek Council of Ministers participated in this meeting.

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## CONFERENCES AND EXPOSITIONS

### SPECIAL INVENTIONS COMMISSION ESTABLISHED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 7-20 Oct 86 p 2

[Article by An. Shakhov: "To Manage the Invention Work"]

[Text] A step in this direction was taken on Monday, 22 September, when the first session of the Special Problem Commission of the Presidium of the USSR Academy of Sciences and the State Committee for Science and Technology (chaired by I.S. Naryashkov, chairman of the State Committee for Inventions and Discoveries) was held in the conference hall of the All-Union Sovnitsentr Association. It initiated the development of the concepts and methodological recommendations for working out the special problem section "Discoveries, Inventions, and Patenting and Licensing Work in the USSR" of the Comprehensive Program of Scientific and Technical Progress in the USSR for the Period 1991-2010.

The development projects underway have an obvious objective but one which is not easy to achieve--to take control over the movement of inventive thinking "from the idea to the machine" so that intellectual capability, which is of key importance to scientific and technical progress:

--is not wasted on secondary or dead-end directions, which can result in losses of material and financial resources (this problem was discussed in the speech by V.Ye. Kurakin, Deputy Chairman of the State Committee for Inventions and Discoveries);

--develops on the basis of the natural patterns of progress in science and technology and the consummation of innovations (Professor Yu.V. Yakovets, department head at the Academy of the National Economy in the USSR Council of Ministers) and is directed toward passing and not just catching up with advanced achievements in science and technology in the world (V.V. Simakov, chief of the Science Department of the USSR Gosplan);

--is guided by the influence of all the factors affecting it: heuristic and sociopsychological, individual and collective (G.O. Krylov, Professor at the Moscow Radio Engineering, Electronics and Automation Institute, and A.I. Polovinkin, Rector of the Volgograd Polytechnic Institute);

--relies on information support which effectively provides information on trends in the development of science and technology and on specific scientific and technical decisions making it possible to assess the practicality of their application and the prospects of a new search (Professor I.A. Boloshin, Deputy Director of the All-Union Scientific and Technical Information Institute, and Professor B.S. Rozov, General Director of the Poisk Scientific Production Association).

The commission adopted a decision defining the directions for developing the concept. The All-Union Scientific Research Institute of Patent Information was approved as the head organization.

The permanent seminar of the State Committee for Inventions and Discoveries, "Intensification of the Economy and Management of Inventions," which supports the Special Problem Commission, began its work the following day, on 23 September. It operates with the participation, directly or externally, of leading specialists in industry, representatives of the USSR Gosplan, patent services, inventors and efficiency experts, and scientists of the USSR Academy of Sciences and the State Committee for Science and Technology.

In subsequent issues of the NTR we shall acquaint the readers with some of the most compelling ideas discussed at the session of the Special Problem Commission.

11499  
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## AWARDS AND PRIZES

### LENIN AND USSR STATE PRIZES AWARDED FOR SCIENTIFIC ACHIEVEMENTS

Moscow PRAVDA in Russian 8 Nov 86 p 4

[Article by Academician A. Aleksandrov, chairman of the Committee for Lenin and USSR State Prizes in Science and Technology under the USSR Council of Ministers: "Steps for Acceleration of Science"]

[Text] The Committee approached all stages of examination of work submitted for prizes with much exactingness in their evaluation. Out of a total of 194 works submitted, 87 were allowed to participate in the competition. The CPSU Central Committee and USSR Council of Ministers bestowed upon submittal by the Committee, the USSR State Prize upon 42 works and 6 textbooks.

Development of space research for peaceful purposes was a vivid manifestation of the advances in machine building, electronics and radio engineering. For the first time in worldwide practice, our scientists and specialists conducted an experiment for the direct investigation of Halley's comet. The joint work of academy institutes and industrial organizations on development of the scientific complex for the Vega Project was awarded the USSR State Prize.

This year, the Lenin prize was awarded for the priority work on radar filming of the planet Venus, which has no foreign analogues. The Venus-15--Venus-16 space complex, which was aboard two spacecraft and operated for 8 months, played an important part in the radar filming. The authors of this work, which involved the latest engineering advances, were also awarded the USSR State Prize.

The developers of methods of controlling an extremely complicated object, the nation's Unified Electric Power System, were awarded a prize. There was broad use of scientific advances with worldwide priority in this project. The recipients developed and introduced to the national economy meteorological radar devices that permit early warning, 2-2.5 hours ahead of time, of dangerous weather phenomena, provide information about precipitations, clouds, which is very important to aviation and agriculture. The economic effect of using them is about 50 million rubles per year.

At the Riga VEF [electric engineering] Association, new guidelines were developed and introduced, for the first time in our country, for industrialization of public catering with use of robotry, automated preparation of menus, cooking and waiting on patrons. This work yields a significant economic and social effect.

Prizes were awarded for new Soviet technologies that have been introduced on a broad scale. We refer to cold welding of flexible nonferrous metal and alloys, improved life of metal-cutting tools due to application of wear-resistant coverings, laser treatment of film in the manufacture of electronic instruments, high-speed heat-treatment for reinforcement of steel and alloys.

There is a highly effective technology for concentration of diamond-bearing ore and placer deposits in Yakutia, which is based on x-ray fluorescence of diamonds.

Prizes were also awarded for development of new types of pipes made of high-alloy and hyper-rust-resistant alloys. The pipes can be used in aggressive chemical media, protect electronic devices against the influence of external fields. Through microplasma welding, small pipes, to 4 mm in diameter, are produced and used in instrument building. The annual economic effect of using this work is in excess of 35 million rubles, and its originality has been confirmed by more than 100 author certificates.

Prize recipients include developers of multipurpose membrane shells for large buildings, which have no equal in worldwide building. The diameter of the shell in the Lenin Sports and Concert Complex in Leningrad is 160 meters in diameter, and the shell in the covered stadium in Moscow is elliptical with 224 and 183 m axes.

The closed system for water supply and waste processing developed at the Pervomayskiy [first of May] Khimprom [chemical industry] Production Association has made a significant contribution to environmental protection. This is a complex of original waste-free resource-conserving technologies for a number of chemical products, including caustic soda and chlorine. Liquid waste is no longer dumped into open reservoirs, and about 30,000 tons of marketable products are obtained from the waste.

Prizes have been awarded for work on effective development of the fuel and power complex of the nation. Development of a set of machines and technologies for hydromechanization used in transport building has been actively involved in development of inaccessible regions in Siberia, including the Tyumen gas and oil regions in the North.

Early ripening corn hybrids for regions with a short frost-free period and vaccines against the dangerous cattle disease, theileriosis, are instrumental in the successful solution of problems facing the nation's agroindustrial complex. The authors of methods of forestation and reinforcing sand in arid regions of the southern European part of our country made a considerable contribution to agricultural reclamation of land.

Considerable advances have been made by medical specialists who have been awarded prizes. Development of methods of intensive care and resuscitation of neonates and infants has improved infant health care, and this is one of the most important problems of modern medicine.

A study that disclosed the mechanism of protein biosynthesis is an outstanding achievement of Soviet biology.

In the area of physics, a prize was awarded for methods of laser diagnosis and examination of high-temperature plasma.

Development of new methods of structural-neutron examination based on neutron scatter is important to the study of the structure of solids, and this permits investigation of the structure of solids, in particular at extrahigh pressure.

There have been priority investigations in molecular spectroscopy, as a result of which spectral resolution has been enhanced by a factor of  $10^4$ - $10^5$ , and its theoretical limit has been reached. For the first time, fine-structure spectra were obtained for a number of complex organic molecules. In the future, these advances may help solve the problem of high-speed holography of processes in the picosecond and nanosecond ranges, examination of chemical and biological processes in living organisms.

The authors of research on chemical properties and stability of unusual valent forms of elements have synthesized higher fluorides of a number of elements and established the patterns of change in their properties.

The authors of mathematical studies on qualitative theory of rotating fluid made an outstanding contribution to development of differential equations with partial derivatives. Their work has important applied implications.

A prize was bestowed posthumously upon L. A. Galin, corresponding member of the USSR Academy of Sciences, for monographs reporting the basic scientific results in the area of mechanics of deformable solids.

The recipients of prizes include the authors of a six-volume encyclopedic work, "Osnovy gidrogeologii" [Bases of Hydrogeology], which has no analogue in Soviet or worldwide science and practice. Prizes were bestowed for a cycle of works on theory of phase synchronization in radio engineering and communications.

In the area of social sciences, the well-known scientist, Prof A. F. Losev, was awarded a prize for his "Istoriya antichnoy estetiki" [History of Ancient Esthetics]. This outstanding six-volume work has gained worldwide recognition. Academician M. P. Kim received a prize for his timely work, "Problemy teorii i istorii realnogo sotsializma" [Problems of Theory and History of Real Socialism]. S. A. Pletneva, doctor of historical sciences, was the recipient of a prize for a cycle of works dealing with the history and culture of nomadic peoples in the USSR in the Middle Ages.

A team of well-known Soviet philologists received a prize for the basic scientific work, "Bolshoy kitaysko-russkiy slovar" [Great Chinese-Russian Dictionary] which contains 250,000 words and expressions.

The works for which the USSR State Prize was awarded in 1986 are making a perceptible contribution to acceleration of scientific and technological progress; they are instrumental in solving problems of radical reorganization of the national economy set forth by the 27th CPSU Congress.

## GENERAL

### CONTRIBUTIONS OF MECHANICS TO PROGRESS

Moscow PRAVDA in Russian 28 Sep 86 p 3

[Article by Academician I. Obraztsov, chairman of the USSR National Committee for Theoretical and Applied Mechanics: "Mechanics in the Service of Progress--Horizons of Science"]

[Text] Current progress in machine building, aviation and space engineering, ship building, transport, hydraulic engineering and the building industry is based, to a significant extent, on the outstanding achievements of the Soviet school of mechanics, which has traditionally held a leading position in worldwide science.

The work of Russian and Soviet scientists in the field of theoretical and applied mechanics, aerohydrodynamics, mechanics of spaceflight, theory of elasticity, flexibility and creep, theory of mechanisms and machinery, building mechanics, theory of filtration, mechanics of friction, theory of optimum processes and systems, and many others have earned worldwide recognition.

Some basically new tasks have been put to the Soviet school of mechanics in the last few years of intensive scientific and technological progress. This applies, first of all, to such an area of application of mechanics as machine building, development of industrial robots and manipulators, automated shops, technologies involving little waste and flexible automated industries. The problems confronting machine building and, consequently, Soviet mechanics, have been reflected in the "Basic Directions of Development of the National Economy" of our country, which were approved by the 27th Party Congress.

We could cite quite a few examples of the beneficial impact of advances in mechanics on acceleration of scientific and technological progress. Thus, one of the vivid events that have drawn the attention of the worldwide community was the fulfillment of the great international project, Vega, i.e., the flight of two spacecraft to the planet Venus and Halley's comet. The main distinctive feature of such experiments is that their results become the legacy of all nations of the world.

Our scientists have made considerable advances in the area of development of hydrodynamics and aerodynamics, optimization methods, digital and continuous-discrete methods, theory of thin membranes, nonlinear mechanics of solid media, various applications of mechanics, in particular, aircraft building, which made it

possible to develop wide-body aircraft and high-power helicopters. Nevertheless, we are substantially behind in the area of introducing basic developments in the practice of producing modern machine-building objects. This applies in particular to agricultural machine building and motor vehicle building. And this is so, in spite of the serious achievements of scientists with respect to solving a number of problems of theory of reliability and resources of machinery, theory of friction and lubrication, and others that served as the basis for development of new technologies and principles of machine operation.

For example, in the area of mechanics of friction--tribological engineering--there has been development of basically new physicochemical effects and phenomena of selective transfer, which make it possible to develop virtually wear-free pairs of items that are subject to friction, which increases substantially machine and mechanism resources. These advances were used in developing mechanisms that operate under extreme conditions: in absolute vacuum aboard spacecraft of different types, in aggressive media and others. However, they have not yet gained mass use in machine building. Both agency barriers and paucity of the experimental testing base of scientific institutions are delaying introduction of the results of investigations and developments.

Conversations about disproportionate financing, on the one hand, of basic research and, on the other hand, of applied investigations and experimental design work have been going on for decades. However, we do not have either the proper analysis on a Unionwide scale or reliable forecasts, or constructive suggestions on how to improve the situation. We believe that it is also time to examine the material and technical support of science, the weakness of which is holding up introduction of its developments. In this respect, the status of the experimental testing base could be assessed with the help of Academy and sector scientific institutions and, particularly, VUZ's, which have a large army of young workers. Such analysis, when conducted with the involvement of scientists specializing in mechanics, would permit preparation of validated recommendations for development of the experimental testing base of all branches of science.

Scientists dealing with basic research in mechanics will have to solve, in the very near future, a wide range of problems in the area of aviation and machine building, mining and mechanics of composite materials. As a specialist in the area of mechanics of composition materials, I should like to mention the great importance of this relatively new field of endeavor. First of all in aviation. Use of composite materials in various aircraft and other constructions lowers their weight, mass and improves their operating qualities.

Contemporary composite materials based on high-strength fibers of different origin and polymer, metal, carbon or ceramic matrices are promising materials not only for aviation and space equipment, but could also be used well in motor vehicles, pipes, containers and apparatus of the chemical industry, ship building, agricultural machine building and in light industry. Broad introduction of such materials is related to further basic research in classical areas of mechanics--theory of anisotropic and heterogeneous deformable solids and theory of optimization. This is a promising field of endeavor for scientific engineers.

We should also mention another distinction of our times, that of penetration of applications of mechanics to areas that are not traditional for it: biology,

medicine, geology, chemistry and other branches of science. Thus, by means of mathematical modeling of turbulent processes in the flow of viscous fluids, it was possible to predict presence of areas of stasis in blood vessels, which are forerunners of atherosclerotic plaques. Theory of dynamic loading and pulsation made it possible to explain the nature of vascular breaks beyond the limits of static strength. There are still many important unsolved problems of mechanics in such applied areas.

It would be impossible to make use of the advances of Soviet mechanics or scientific progress without having young and energetic replacement of personnel. To do this, Soviet higher schools are undergoing changes, the basis of which is integration of science, education and production in the interests of specialized training of highly qualified specialists. In a number of VUZ's, such work has already begun in the form of concluding long-term agreements with scientific institutions and industrial enterprises.

The training program is based on three general principles: cooperation with industry and the USSR Academy of Sciences, flexible system of education and computerization of the educational process. Flexibility of the educational system is obtained by introducing intensive teaching methods based on automated systems. VUZ's are granted the right to modify curriculums and syllabuses, by agreement with client sectors, by means of increasing to 20% the class time reserved for the VUZ council.

The very approach to education is new in specialized training, as compared to traditional education: already in the lower years, a concrete promising assignment is formulated for the student (at the recommendation of the client enterprise) that is ahead by several years of the level of development of the enterprise. While performing this assignment, the student works more intensively and purposefully, he develops internal conviction as to the necessity of passing the scientific classes to achieve the goal that has been set, rather than merely to pass tests.

However, such specialized training can be offered only on a modern scientific and experimental basis with the involvement of Academy and branch scientific research institutions and progressive industrial enterprises. The educational process requires involvement of scientists and specialists, primarily engineers, in educating and training students. We believe that involvement in the training of our scientific replacements must become mandatory for every specialist, it must become his sacred duty in the matter of rearing the next generation of scientists.

These are merely some of the most important problems, in my opinion, of the Soviet school of engineering. They have been discussed constructively and in an interesting way at the 6th All-Union Congress of Mechanics, which will determine in many respects the directions of further work in the area of theoretical and applied mechanics.

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## MERIT SYSTEM OF REMUNERATION FOR SCIENTIFIC PERSONNEL DISCUSSED

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[Article by A. A. Tursunov, doctor of philosophical sciences (Dushanbe):  
"Scientific Potential--Problems and Opinions"]

[Text] The reform currently being implemented in the system of remunerating scientific workers, as well as the previous reorganization of the USSR Higher Certification Commission address themselves to put a firm stop to lack of talent and drabness. In fact, however, everything turns out to be peculiar: new systems leave sufficient latitude for those who are mediocre to manipulate their way and subsequently successfully cross the minefield of barriers and bans.

At any rate, not everything has been well-thought out in the new system of remuneration for scientific work. It eliminated the former privileges of a person with a scientific degree, but did not alter the situation where the job is in first place, as before, rather than the work (not to mention its results).

It is good that scientific research institutes now have a stable salary fund, broader and more flexible gradation of positions, and that the directors have relatively more rights, in particular for offering incentives. The new system also clearly indicates the source from which the required resources should be gleaned: it is imperative to get rid of scientific deadweight, particularly those who are accustomed to earning through science, rather than working in science. However, it is easy to say that we should get rid of them! In fact, the other side often has more rights than the director.

Indeed, let us assume that a director decides to change to a one-step system of administration, to combine sectors that are small and wallowing in insignificant projects into relatively large departments. His decision must be sanctioned by a chain of departments--scientific council, appropriate department and the presidium of the Academy of Sciences. But, can the director count on the approval of the scientific council, which includes administrators of most of the sectors he wants to eliminate? Only one thing remains: the director must maneuver in the limited space of possibilities, he must conduct "explanatory work," search for roundabout routes, make compromises, etc., not without risk to his prestige.

Would it not be simpler to discuss plans for reorganizing institutes directly in the office of the relevant department or even in the presidium of the Academy of Sciences? This authoritative academic offices could hear and thoroughly discuss the proposals of management about the basic directions of scientific work at an institute and make the appropriate decision. I even think that the certification commissions should not be entirely intramural. At least they should be headed by "outsiders," just like the chairmen of state examination commissions at VUZ's.

The question of retired scientists is also very complicated and delicate. Is it not time already to put in order this rather touchy matter in the form of legislation? For example, considering the specifics of mental work, one could raise retirement age for scientists by, let us say, 5 years, and then be governed primarily by the interests of the work in settling this problem.

There is an equally acute and difficult "reverse problem," that of scientific replacements. In the recently promulgated "Basic Directions of Reorganization of Higher Schools," there are some new constructive ideas, the systematic implementation of which will, no doubt, help raise the quality of training young specialists. In my opinion, the system of training scientific personnel through graduate studies also requires similar alteration.

In the course of organizational changes, one must also pay attention to an equally dangerous phenomenon, such as self-serving imitation of everything that exists or is developed at a center. This trend makes itself known in the most diverse areas, including scientific organizational. Indeed, how else can we explain the desire of some academies of Union republics to copy the topics and structure of central academic institutes and thus to reach the frontiers of progress without having either an adequate material base or personnel, if not because of a race for falsely understood national prestige? Just try to shut down even some of these "prestigious" investigative projects which are not being pursued on a proper research level! You would be immediately accused of a grave sin--scientific provincialism!

I am convinced that provincialism in science is not a disease of growth, but an organic flaw that must be eradicated. But the great pathos of the style should not cloud the issue: scientific provincialism is often manifested in the methodology of investigation, in the very thinking of investigators, rather than in their topics.

There is another sore point.

Under prevailing conditions of publicity and increase in critical potential of public awareness, it has become difficult for all sorts of lovers of "easy money" (including those involved in science) to live. But ... let us not forget something else: it is also not easy for honest, principle-minded people to work, particularly those who are called upon to head the clean-up work started by the party on their own territory. For even those who for years became adept at demagoguery are rising on the crest of the wave of broad public movement for reorganization. We are not referring to time-servers or those who are over-cautious, whom a poet cleverly called the "what ifs." We are referring to the category of our citizens that is shouting more and louder than everyone else about social justice, about the "revolutionaries" who try to conceal their lack of moral preparedness for change under the drumbeat of noisy phrases.

At present, there are dramatically greater requirements as to the personality of an administrator. Purity of moral image of an official, flawlessness of his moral posture are just as important as his professional competence and managerial skills.

At the present time the most important thing is to change peoples' attitude toward their work. And this is primarily and mainly a moral question. For this reason, organizational change must be associated with change, not only in psychology and thinking, style and methods of working, but, which is equally important, change in values of the personality.

10657

CSO: 1814/55

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